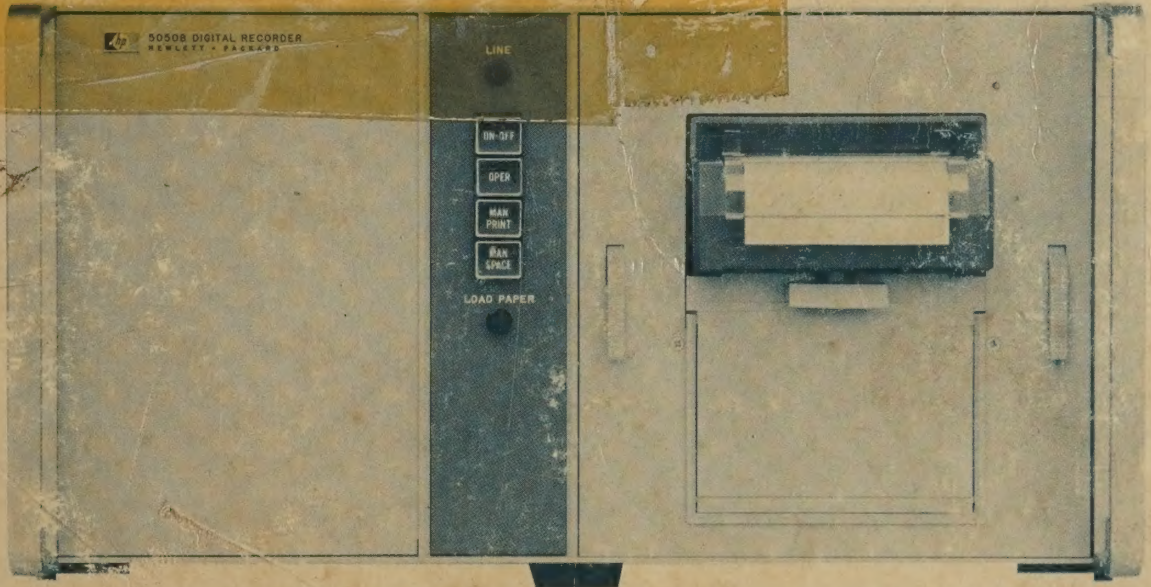



JOE BRIGGS

OPERATING AND SERVICE MANUAL

JOHN HUMPHREY
DANBURY CONN

DIGITAL RECORDER 5050B



HEWLETT  PACKARD

CERTIFICATION

The Hewlett-Packard Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau of Standards to the extent allowed by the Bureau's calibration facility.

WARRANTY AND ASSISTANCE

All Hewlett-Packard products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, or, in the case of certain major components listed in the operating manual, for the specified period. We will repair or replace products which prove to be defective during the warranty period provided they are returned to Hewlett-Packard. No other warranty is expressed or implied. We are not liable for consequential damages.

Service contracts or customer assistance agreements are available for Hewlett-Packard products that require maintenance and repair on-site.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

DIGITAL RECORDER

5050B

SERIAL PREFIX: 908-

This manual applies directly to standard Hewlett-Packard Model 5050B Digital Recorders having serial prefix 908-.

5050B SERIALS PREFIXED: 836-

Table 6-1 lists the changes required to make this manual apply to these older instruments.

5050A SERIALS PREFIXED: 720-, 740-, 744-, 752-, 828-

Table 6-2 lists the changes required to make this manual apply to these older instruments.

SPECIAL INSTRUMENTS AND SERIAL PREFIXES NOT LISTED

The information required to relate this manual to special modifications, or to newer instruments with serial prefixes not listed, is supplied on special insert sheets. If this information is missing, contact any HP sales and service office, giving full specification number, instrument name, and serial number.

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1501 PAGE MILL ROAD, PALO ALTO, CALIFORNIA, U.S.A.

02800-2

Printed: MAY 1969

MANUAL CONTENT AND ORGANIZATION

The best guides to manual content and organization are the Table of Contents, List of Illustrations, and List of Tables on pages iv and v. The manual is divided into seven sections, covering,

- I GENERAL INFORMATION: specifications, applications, accessories.
- II INSTALLATION AND OPERATION: unpacking and inspection, repackaging for shipment, rack mounting instructions, power and signal requirements, setup instructions, operating instructions.
- III PRINCIPLES OF OPERATION: technical details of circuit operation.
- IV MAINTENANCE: routine maintenance, performance check, troubleshooting, adjustment procedures.
- V PARTS LISTS: parts descriptions by reference designator, total quantity of each part type in instrument (except for options).
- VI OPTIONS AND MANUAL CHANGES: details of Options available, backdating information for older instruments.
- VII CIRCUIT DIAGRAMS: block and schematic diagrams for instrument, pictorial component locators for instrument and sub-assemblies (including options 15, 50, 51, and 55).

Comments on this manual are welcome at any Hewlett-Packard sales and service office.

MANUALS AND MANUAL CHANGES (ORDERING INFORMATION)

This manual provides operating and service information for all Hewlett-Packard Model 5050B Digital Recorders. Manual changes required for special instruments and for instruments with serial numbers higher than the one to which this manual applies directly will be detailed in special change sheets included with the manuals for those instruments. If this special information is missing, it may be obtained from the nearest Hewlett-Packard sales and service office listed at the back of this manual. When requesting information or additional manuals, be sure to include the complete model (or specification, if a special instrument) number, instrument name, and serial number.

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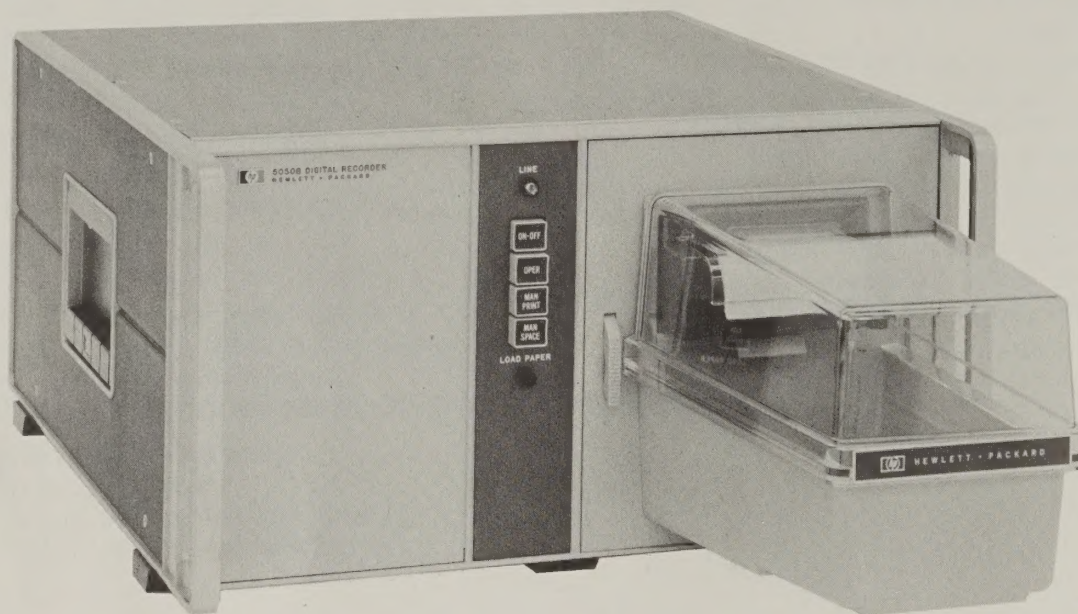
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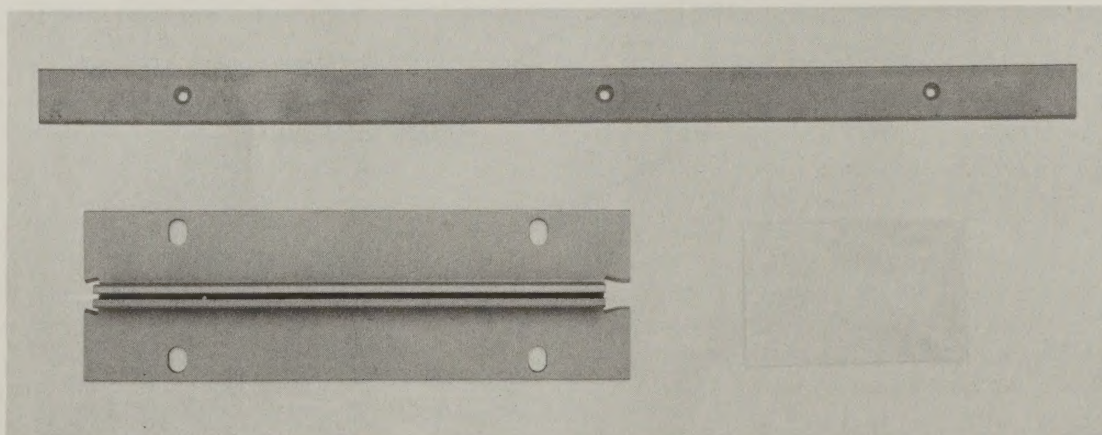
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Figure 1-1. Model 5050B Digital Recorder

5050B



RACK MOUNTING KIT



SECTION I

GENERAL INFORMATION

1-1. DESCRIPTION

1-2. The Hewlett-Packard Model 5050B Digital Recorder accepts up to 20 columns of 4-line binary-coded electrical inputs from one or two data sources and will print up to 18 columns at rates up to 20 lines per second. The standard Model 5050B can be "customized" by the user to suit his requirements, as follows:

a. Data can be accepted from one or two sources. Capacity is 20 data columns, 10 through each input connector. For special considerations when operating from more than two data sources or a data source of more than 10 columns, see Figure 2-2.

b. Input data can be in any one of three binary codes: +1248, -1248, or +1224; truth tables for these codes are given in Table 1-1. The data sources must have the same code. (Data codes not listed here, or operation from data sources with different codes requires a special Model 5050B, see Paragraph 1-5c).

c. Each column receiving input data can be made to react to that data in one of three ways (see examples in Figure 1-2).

- 1) Any data input code can cause a printed output of the corresponding symbol (see Truth Table, Table 1-1).
- 2) One data input code can be "ignored", causing its corresponding symbol to be omitted from any printed output; a blank space appears in this case. This is referred to as "character suppression."
- 3) The character suppression program can be modified to cause the suppressed character to be printed when the next more significant column has a printed output. This is referred to as "suppression defeat."

d. Input data can be printed in any column (see Figure 1-2).

e. Standard paper tape (for inked printout) or pressure-sensitive paper tape (for inkless printout) may be used (see Paragraph 2-41).

f. Line spacing can be varied between 3.5 and 4.5 lines per inch (see Figure 1-2).

g. The Model 5050B can be operated from 115- or 230-volt, 50-60 Hz ac power. (For 50-Hz operation considerations, see Paragraph 1-13).

h. The Model 5050B accepts positive or negative print commands from either or both data sources, and provides both positive and negative inhibit signals for the data sources.

Table 1-1. Truth Table

Standard Print Wheel Character	Input Code (code discs supplied)		
	+1248 ABCD	-1248 ABCD	+1224 ABCD
0	LLLL	HHHH	LLLL
1	HLLL	LHHH	HLLL
2	LHLL	HLHH	LHLL
3	HHLL	LLHH	HHLL
4	LLHL	HHLH	LHHL
5	HLHL	LHLH	HHHL
6	LHHL	HLLH	LLHH
7	HHHL	LLLH	HLHH
8	LLLH	HHHL	LHHH
9	HLLH	LHHL	HHHH
+	LHLH	HLHL	LLLH
-	HHLH	LLHL	HLLH
V	LLHH	HHLL	LHLH
A	HLHH	LHLL	HHLH
Ω	LHHH	HLLL	LLHL
*	HHHH	LLLL	HLHL

"H" = "1" in any "+" code or "0" in any "-" code.
"L" = "0" in any "+" code or "1" in any "-" code.

1-3. The basic instrument consists of the printer mechanism and electronics, except for the Column Board Assemblies (required, see Paragraph 2-18a) and input cables, which must be ordered separately. Code discs for +1248, -1248, and +1224 codes are included with the basic instrument. The two extra code discs are in a coin envelope in the shipping carton along with the paper hopper, ink roller and paper pack. Special discs for other codes may be ordered at any time. All mechanical and electrical specifications for the Model 5050B are listed in Table 1-2.

1-4. DEFINITIONS

1-5. The terms listed below have the meaning indicated when used in this manual.

a. Standard Model 5050B. Any instrument not specially modified by installing special print wheels, a special code disc, special circuit changes or mechanical parts changes affecting its operation. Although the Column Board Assemblies are options, they are included in descriptions of the basic instrument because they are required for operation of all instruments.

b. Options. Options are variations in the basic Model 5050B that may be ordered without making the instrument a "special." All currently available options are listed in Table 1-3. The Column Board Assemblies required for operation are listed as an option because the number of boards required can vary, depending on the application.

Table 1-2. Specifications

A. SPECIFICATIONS

ACCURACY: Identical to input device used.

PRINT CYCLE TIME: 50 ms.

PRINTING RATE: 20 lines/s maximum.

PRINT WHEELS: 16 positions, numeral 0 through 9, +, -, V, A, Ω, *, ; other symbols available.

COLUMN CAPACITY: Connectors accommodate 20 columns of data, 18 of which can be printed. One column board (not supplied, see Order Check List) is required for each two columns used.

PAPER REQUIRED: HP folded paper tape. Approximately 15,000 lines per packet with minimum spacing (18,000 with pressure sensitive paper). See Section D below.

LINE SPACING: Adjustable, 3.5 to 4.5 lines per inch.

INKING: Ink roller or pressure sensitive paper.

OPERATING TEMPERATURE: -20°C to +55°C with pressure sensitive paper, +10°C to +40°C with ink.

ELECTRICAL (Without Data Storage):

Data Input: Parallel entry, BCD (8421, 4221), "1" state must differ from "0" state by at least 4.5V but by no more than 75V.

Reference Voltages: BCD codes require both "0" and "1" state references; reference voltages may not exceed ±150V to chassis; "0" and "1" state reference voltages must differ by at least 4.5V; generally they fall within the data input levels but can exceed them with 0.5V in both directions.

Hold-off Voltage: Both polarities are available simultaneously for BCD codes and are diode-coupled; 10 mA maximum load ±15V open circuit from 1 kΩ source.

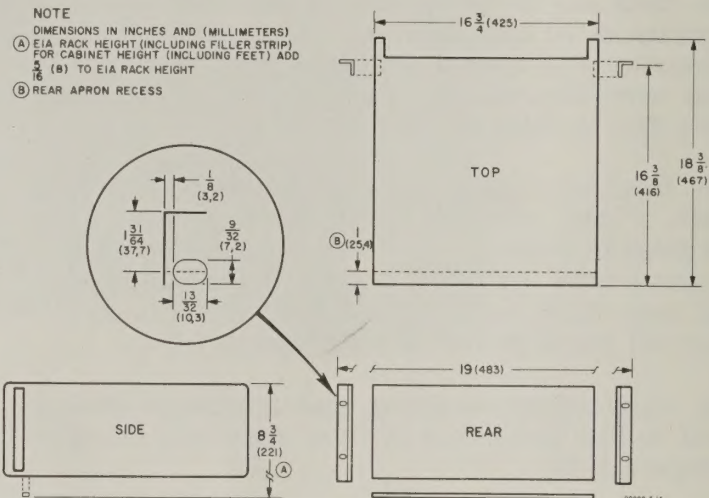
Print Command: + or - pulse, 4.5 to 20V amplitude, 1V/μs minimum rise time, 20 μs or greater in width, ac coupled. Input impedance is approximately 1500Ω.

INPUT CONNECTORS: Chassis: Amphenol or Cinch type 57-40500-375, HP Part No. 1251-0087, 50-pin female. Mating input cable connector: Amphenol or Cinch type 57-30500-375, HP Part No. 1251-0086, 50-pin male.

POWER: 115 or 230V ±10%, 60 Hz, approximately 100 W idle, 190W at 20 lines/s. Add 5W for Options 50, 51; 8W for Option 55.

WEIGHT: Net, 40 lbs (18 kg). Shipping, 53 lbs (24 kg).

DIMENSIONS:



ELECTRICAL (With Data Storage Options):

Data Input: Parallel entry, BCD, "1" state must differ from "0" state by at least 1.3V but by no more than 35V. Input drive 100 μA. Data must be on lines when print command occurs and remain until release of hold-off (85 μs after print command).

Reference Voltages: The data source must provide reference voltages, either both levels (High and Low) or one level (Low.). If both levels are provided, max reference voltage may not exceed ±50V to chassis. Load between the reference lines: 20kΩ. Internal control can vary BCD trigger level within reference voltages. If Low reference voltage only is provided, maximum reference voltage may not exceed ±20V to chassis. Reference line must be able to supply up to 20 mA. The minimum BCD High voltage is approx. 2.1V above reference voltage. The maximum BCD Low voltage is approx. 0.8V above the reference voltage.

Hold-off Voltage: Both polarities are available simultaneously for BCD codes and are diode coupled; 10 mA max load ±15V open circuit from 1 kΩ source.

Print Command: + or - pulse, 2 to 20V amplitude, 1V/μs minimum rise time, 6 μs or greater in width, ac coupled.

Table 1-2. Specifications (cont'd)

B. EQUIPMENT SUPPLIED

CODE DISCS: Three supplied (one installed in printer mechanism as ordered):

+1248	HP Part No. 05050-2040
-1248	HP Part No. 05050-2047
+1224	HP Part No. 05050-2020

Code discs, inked roller, and paper packed in shipping carton in plastic paper hopper.

INKED ROLLER: One black roller (HP Part No. 9260-0071) supplied. (Other colors and mixed-color rollers available on special order.)

PAPER: One packet standard paper, fan-folded, HP Part No. 9281-0386.

One packet pressure-sensitive, fan-folded, HP Part No. 9281-0387.

RACK MOUNTING KIT: HP Part No. 05050-6016.

TERMINAL BOARD ASSEMBLY: HP Part No. 05050-2058. Board is installed in Recorder.

FUSE: 1.6 amp for 230 Vac power.

C. EQUIPMENT REQUIRED BUT NOT FURNISHED

COLUMN BOARDS: One to ten required (each board handles two columns), HP Part No. 05050-6002.

INPUT CABLES (one or two required):

Option 32: For most HP Electronic Counters, Digital Voltmeters, etc.; 50-contact male connectors on each end (Amphenol or Cinch Type 57-30500-375; HP Part No. 1251-0086); 6 feet long; accommodates up to 10 columns of binary-coded data. HP Part No. of cable assembly: 562A-16C.

Option 35: For HP Model 5216A; 36-contact printed circuit connector (HP Part No. 1251-0334) at 5216A end of 50-contact male connector (HP Part No. 1251-0086) at 5050A end; 6 feet long; accommodates up to 7 columns of binary-coded data; HP Part No. of cable is HP 10513A.

D. ACCESSORIES AVAILABLE

ALTERNATE CODE DISCS: Order by description (include truth table showing code versus character desired).

PAPER: Standard: For one packet, order HP Part No. 9281-0386. For 15-packet carton, order HP Part No. 05050-8002.

Pressure Sensitive: For one packet, order HP Part No. 9281-0387. For 15-packet carton, order HP Part No. 05050-8003.

INKED ROLLER: All black: HP Part No. 9260-0071. Other colors and mixed-color rollers available on special order.

MATING CONNECTOR FOR A1J1 OR A1J2: Amphenol or Cinch, Type 57-30500-375; HP Part No. 1251-0086; 50 contact male connector.

INPUT CABLES: See Section C of this Table.

REPLACEMENT AC POWER CORD: Order HP Part No. 8120-0078.

REPLACEMENT PRINT WHEEL: Order HP Part No. 05050-6040.

REPLACEMENT PAPER DEFLECTOR: Order HP Part No. 05050-4026.

REPLACEMENT INK ROLLER COVER: Order HP Part No. 05050-4028. (Fits all 5050A's).

DATA STORAGE KITS: Order by description, giving complete instrument serial number and whether storage is for 10 or 20 columns. Installation instructions are included with kits.

DIGITAL CLOCK KITS: Order by description, including complete instrument serial number.

SERVICE KIT: Order HP Part. No. 05050-6023.

Consists of: Extender Board Assembly (HP Part No. 05050-6024).

Mechanism Extender Assembly (HP Part No. 05050-6025).

Table 1-3. Options

Option No.	HP Part No.	Description
10	05050-2052	Larger pulley for printer mechanism; allows 20 line-per-second printing when 5050B is operating from 50 Hz ac power. ¹
15	05050-6047	Motor Control. Stops motor 5 secs. after print command. ¹
20	05050-6002	Column Board Assembly; one to ten required. ^{1, 2}
32	562A-16C	Input cable for up to 10 columns of binary-coded data. Terminated at each end with Amphenol or Cinch Type 57-30500-375. 50-contact male connectors. ¹
35	HP 10513A	Input cable for up to 7 columns of binary-coded data. Terminated with one 36-contact, printed-circuit connector and one 50-contact male connector. Used with HP Integrated-circuit counters (HP Models 5216A, 5221B, 5321B). ¹
50	See Table 6-1	Data storage feature for both input connectors. ¹
51	See Table 6-1	Data storage for one input connector (A1J1) only. Same as Option 50, except only one data source. ¹ A1J2 installed for 10 columns without storage.
55 (Incl. Opt. 15)	See Fig. 7-13	Digital Clock. Indicates time by digital display to 23:59:59, by printed output to 23:59:59.9. Can be used to control print interval (rate) of system (see Specifications, part of Figure 7-12). ¹ Includes Opt. 15 above.
¹ Not included with basic instrument. ² Described throughout this manual.		

c. "Special" instruments. Any Model 5050B modified by installing a special print wheel, inked roller, code disc, or other electrical mechanical modification affecting its operation (other than options) is a "special" instrument. Special instruments are identified by letter-and-number prefixes added to the instrument number (for example, "Specification H001-5050B"). The manual for a special instrument will include a special supplementary insert sheet describing the change(s). Replacement copies of the insert sheets are available on request by contacting the nearest Hewlett-Packard sales and service office listed at the back of this manual. Include complete specification number, instrument name, and eight-digit serial number when requesting information.

d. Code: The arrangement of "H" and "L" voltages (see j and k below) used to identify one number in the binary system. In a 4-line binary code system there are 16 possible code combinations (see Table 1-1); the 6 combinations not used for decimal characters ("0" through "9") can be used for special symbols (V, A, Ω , +, -, *).

e. Code Disc: The disc that generates the drum position code (see i) in the Model 5050B. All input codes are compared against the code generated by this disc and the optical encoder assembly.

f. Character suppression: One character in any column can be suppressed, as determined by the installation of programmable diodes for that column. Character suppression can be defeated by a signal from the next more significant column.

g. Column: two terms are used:

- 1) Input data column (or data column): any one of the twenty 4-line input columns (10 columns through each rear-panel connector, A1J1 or A1J2).
- 2) Printer column (or print column): any one of 18 output columns. Any printer column can be connected to the output of any input data column.

h. Data: The input signal from the data source to any input data column. The input signal generally consists of the four code voltages and two reference voltages.

i. Drum Position Code: An optically generated code that identifies the character in each printer column that is in position to be printed. This code is determined by the code disc. This code is fed simultaneously to all column board columns.

j. "H": The more positive of two possible levels of code or reference voltage. Stands for "high". (See Table 1-1).

k. "L": The more negative of two possible levels of a code or reference voltage. Stands for "low".

l. LASCR: Light Activated Silicon Controlled Rectifier.

m. Not synchronous (referring to print cycle): The start of the print cycle is not synchronized to any particular print drum or code disc position.

n. Print drum: The assembled 18 print wheels containing the characters that can be printed. Each wheel is for one printer column and contains 16 characters, corresponding to the 16 possible code combinations in a 4-line binary system.

1-6. INSTRUMENT IDENTIFICATION

1-7. Each Model 5050B is identified by a two-section, eight-digit (000-00000) serial number on a plate on the rear panel (see Figure 2-3). The five-digit number is an identification number unique to each instrument, and the three-digit number is a serial prefix number used to document changes.

1-8. All instruments with the same serial prefix are the same. The group of instruments to which this manual applies directly is identified on the title page. For older instruments (lower serial numbers), make manual changes listed in Section VI. For newer instruments, which have serial numbers higher than those listed on the title page, a Manual Changes sheet is included describing the required manual changes. The manual for an instrument having special electrical or mechanical modifications affecting its operation will have an insert sheet describing the modification.

1-9. Manual and change sheet ordering information is given on page 6-1. Be sure to include the complete instrument Model or Specification number, instrument name, and complete eight-digit serial number in correspondence about the instrument.

1-10. OPTIONS

1-11. All currently available options for the Model 5050B are listed in Table 1-3. The options that involve changes to the basic instrument (Option 10 and Options 50 and 51) are described in Paragraphs 1-12 and 1-14, respectively. Option 15 is described in Paragraph 1-19. Because the Column Board Assemblies (Option 20) are required for instrument operation, they are described throughout this manual and treated as part of the basic instrument.

1-12. Option 10. 50-Hz Operation

1-13. The Model 5050B printer motor operates at reduced speed when the ac power line frequency is 50 Hz. This reduced speed changes the timing of the instrument, slowing the maximum print rate to 16.7 lines per second, and requires adjustment of the optical encoder assembly (see Section IV). Option 10 replaces the standard print motor drive pulley with a larger one, making the timing correct for 50 Hz operation without adjustment of the optical encoder. To operate from 60 Hz ac power, the larger pulley should be replaced with the standard one. Either pulley may be ordered and changed in the field.

1-14. Options 50 and 51. Data Storage

1-15. The data storage options insert IC buffer storage circuits between the rear-panel input connectors and the column boards. Data transfer time is reduced to 100 μ sec, and input sensitivity is increased, allowing the 5050B to be used in applications where the data source voltage difference between H CODE and L CODE levels is not large enough for the standard instrument. All data and reference signal connections for these options are the same as the standard instrument; the additional power and gate signals required by the Input Boards are supplied through an additional connector for each board.

1-16. With either data storage option, an input print command causes an inhibit period of approximately 100 μ sec. At the end of this period, data is transferred to storage in the 5050B, the print cycle begins, and the data source is released to acquire new data. The print cycle lasts 50 milliseconds; if the data source completes its cycle during the print cycle, it is inhibited by the 5050B until the print cycle ends, then the new data is transferred into the 5050B. No data is lost, but none is acquired while the data source is inhibited.

1-17. Option 55. Digital Clock

1-18. The digital clock provides a visual display of time from zero to 23 hours, 59 minutes, 59 seconds, and can provide printed outputs from zero to 23 hours, 59 minutes, 59.9 seconds. The digital clock can be used to control print interval at one print per 0.1 sec, 1 sec, 10 sec, 1 min, 10 min, 1 hr. Clock control of print rate is accomplished by using the clock to inhibit the data source connected at A1J1 (with print command select switch for A1J1 in its upper position). Printing cannot occur until inhibit signal to this data source ends, allowing a data acquisition cycle (which ends with a print command). Option 55 Recorders require +8421 or -8421 code disc unless special print wheels are installed.

1-19. Option 15. Print Motor Control

1-20. The print motor control option keeps the print motor turned off until a print command is received, then starts the motor. The motor will turn off after printing if another print command is not received within 5 seconds after completion of print cycle.

1-21. INPUT SOURCES

1-22. The Model 5050B can operate from a wide variety of digital sources, including electronic counters, digital voltmeters, computers, digital clocks, tape punch sets. The input capacity can be increased by connecting the output of a HP Model 2512A High-Speed Digital Scanner (or similar instrument) to the 5050B input, and then connecting several data sources to the scanner inputs. The scanner is programmed to select one of its input sources as input to the 5050B or can scan the sources in any of several programs.

Figure 1-2. Printed Output Sample

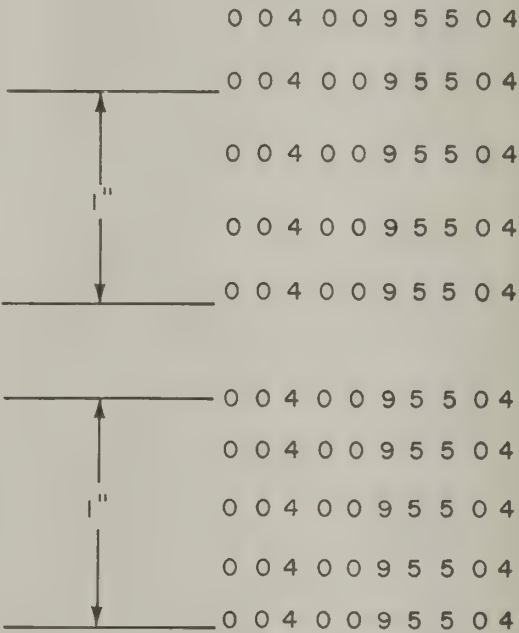
Data Source;

HP Model 5245L Electronic Counter
Function control set to MANUAL STOP
Display 40095504, no decimal point, no
measurement units

REACTION TO INPUT DATA
(EACH INPUT COLUMN):

- A. Any data input code can cause a printed.....0 0 4 0 0 9 5 5 0 4
output.
- B. In each column one data input code (in.....4 9 5 5 4
this case "0") is "ignored", and does
not cause a printed output.
- C. Same as "B", except programmed so "0" 4 0 0 9 5 5 0 4
can be printed if number to its left is
printed.
- D. The printer output can be put in any 0 0 4 0 0 9 5 5 0 4
of the 18 columns.
0 0 4 0 0 9 5 5 0 4

- E. Line spacing can be varied between 3.5
and 4.5 lines per inch.



SECTION II

INSTALLATION AND OPERATION

2-1. UNPACKING AND INSPECTION

2-2. General

2-3. If shipping carton is damaged, ask that carrier's agent be present when instrument is unpacked. Inspect instrument for damage (scratches, dents, broken knobs, etc.). If instrument is damaged or fails to meet specifications (see In-Cabinet Performance Check, Table 4-3), notify carrier and the nearest Hewlett-Packard sales and service office immediately. (Sales and service offices are listed at the back of this manual). Retain shipping carton and padding material for carrier's inspection. The sales office will arrange for repair or replacement of your instrument without waiting for claim against carrier to be settled.

2-4. A standard Model 5050B is set up as follows when it is shipped from the factory:

a. Column Board Assemblies (ordered separately; see Table 1-2C) are installed, beginning at farthest right position (A14) and working toward left. The programmable diodes for character suppression are installed to suppress "0" in the code ordered (see Paragraph 2-20). All suppression jumpers in the system are installed in their upper positions (see Figure 2-4).

b. The print hammer solenoids are connected, in order, to the Column Board Assembly output pins, starting with print hammer #1 (farthest right in printed output) connected to output of A1J1 column 1. When fewer than nine Column Board Assemblies are installed, print hammer solenoid wires not connected to standard Column Board Assemblies are connected to a Terminal Board Assembly provided for this purpose; the Terminal Board Assembly may be installed in any unused Column Board position.

c. Paper and inked roller are not installed.

d. The code disc for the code ordered is installed.

2-5. Any new or modified 5050B installation requires the following steps:

a. Determine Column Board requirements. (See Figure 2-3).

b. Determine and perform character suppression programming (column board setup, see Figure 2-4).

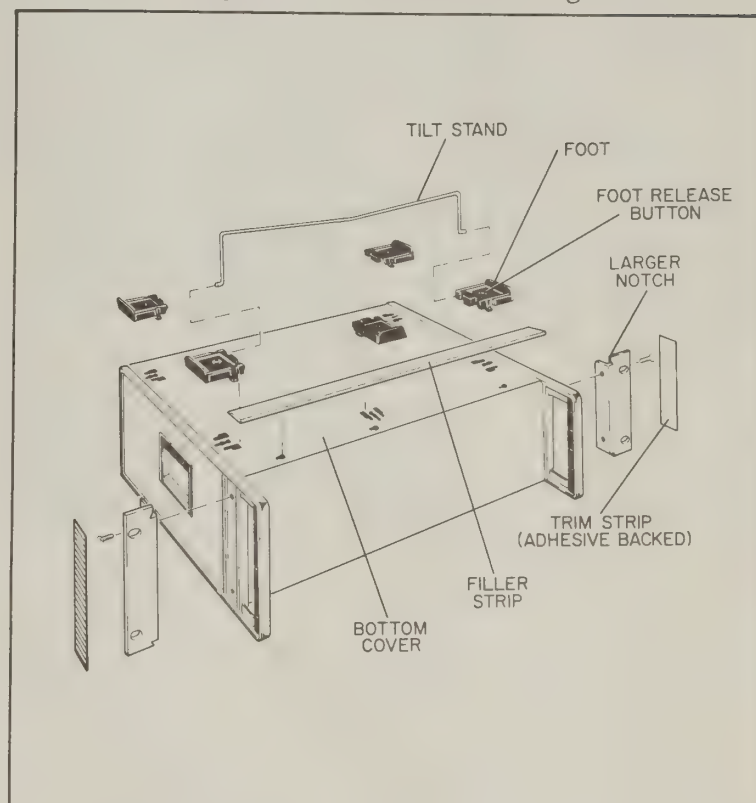
c. Install Column Board Assemblies.

d. Determine and perform print hammer connection.

e. Determine and perform print command requirement selection (see Paragraph 2-18e).

f. Determine and perform ac operating voltage selection (see Paragraph 2-18f).

Figure 2-1. Rack Mounting



g. Be sure front-panel ON/OFF switch is in its "out" position, then connect ac power cord and data sources to 5050B as planned.

2-6. Rack Installation

2-7. The Model 5050B is ready for bench operation as shipped from the factory. Additional parts necessary for rack mounting are packaged with the instrument. The rear panel setup arrangements described in Paragraph 2-18 should be made before rack mounting the instrument; the rack installation should allow access to rear panel so these connections can be changed, if desired, and there should be a free flow of cooling air at the rear-panel vents. To convert the Model 5050B for rack installation, refer to Figure 2-1 and proceed as follows:

a. Remove tilt stand.

b. Remove feet (press the foot-release button, slide foot toward center of instrument, and lift off).

c. Remove adhesive-backed trim strips at front end of sides.

d. Attach filler strip along bottom edge of front panel.

e. Attach flanges to front end of sides where trim strips were removed (larger corner notch of flange is toward bottom of instrument). The Model 5050B is now ready to mount in a standard rack.

2-8. STORAGE AND SHIPMENT

2-9. Packaging

2-10. To protect valuable electronic equipment during storage or shipment, always use the best packaging methods available. Your Hewlett-Packard sales and service office can provide packaging material such as that used for original factory packaging. Contract packaging companies in many cities can provide dependable custom packaging on short notice. Here are two recommended packaging methods:

a. **RUBBERIZED HAIR.** Cover painted surfaces of instrument with protective wrapping paper. Pack instrument securely in strong corrugated container (350 lb/sq in. bursting test) with 2-inch rubberized hair pads placed along all surfaces of the instrument. Insert fillers between pads and container to ensure a snug fit.

b. **EXCELSIOR.** Cover painted surfaces of instrument with protective wrapping paper. Pack instrument in strong corrugated container (350 lb/sq in. bursting test) with a layer of excelsior about 6 inches thick packed firmly against all surfaces of the instrument.

2-11. Environment

2-12. Conditions during storage and shipment should normally be limited as follows:

- a. Maximum altitude: 20,000 feet (6,1 km).
- b. Minimum temperature: -40°F (-40°C).
- c. Maximum temperature: +212°F (+100°C).

2-13. When the Model 5050B is to be stored for long periods, especially where humidity is low, the inked roller should be removed and wrapped securely in plastic or other material to prevent drying out. Instructions for removing inked roller are given in Paragraph 2-33.

2-14. INSTALLATION

2-15. General

2-16. The most efficient way to install the 5050B is to begin with the rear-panel setup, then mechanism setup and paper installation. Operating instructions begin at Paragraph 2-48. Front- and rear-panel controls are identified in Figure 2-3.

2-17. Rear Panel Setup

2-18. Column Board Assembly installation, character suppression programming, printer connection, data source connection, print command requirement selection, and ac power connection are performed at the rear panel, as follows:

a. Determine Column Board Assemblies required, as described in Figure 2-2. A column board assembly is required for any data input column from which a printed output is desired. Each Column board assembly handles two data input columns. Up to five column board assemblies are required for each input connector, depending on the number and location of input columns from which a printed output is desired.

b. Determine that character suppression programming is correct for your installation. This should be done whenever the character suppression program is likely to be changed, either because the 5050B is to be used in a new installation, or because the printout requirements for an existing installation are changed.

1) If the 5050B is operating, disconnect it from ac power and data sources.

2) Unlock and open rear-panel door.

3) Disconnect print hammer leads from column boards as required to remove the boards on which the character suppression programming is to be checked or changed.

4) Remove each Column Board Assembly on which the character suppression programming is to be checked or changed.

5) Install character suppression programming diodes and suppression defeat jumpers as described in Figure 2-4. Do this for each column on each board involved.

6) As character suppression programming is set up on each Column Board Assembly, plug the assembly into its correct position (see Figure 2-2).

7) Connect print hammer solenoid wires as described in step c.

c. Connect print hammer solenoid wires to column board assembly output pins. Printer output columns are numbered from 1 to 18, beginning at right-hand edge of paper tape (see Figure 2-2). Any printer column may be connected to any Column Board Assembly output pin. The 18 printer column input leads come up through the Column Board support guide at center rear of instrument. The leads are color-coded; the color of the wire for each printer column is listed in Table 2-1, and silk-screened on the inside of the 5050B rear-panel door. The wires are connected to the Column Board Assembly output pins by friction connectors; pull on connector to open connection, push connector on pin to make connection. When fewer than 18 printer columns are used, position of printed output on tape can be changed (see Figure 1-2). To prevent erratic printed outputs, print hammer wires should not be connected to the output of a Column Board Assembly column that does not have a data source input. When fewer than 18 columns are being printed, install Terminal Board Assembly provided with 5050B in one of the unused Column Board Assembly positions and attach unused print hammer solenoid leads to connector pins at rear of board; this prevents unused print hammer leads from being shorted to ground.

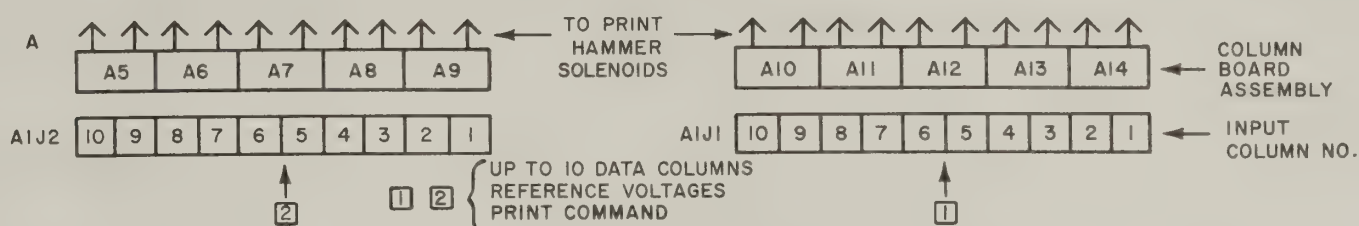
d. Close and lock rear panel door.

e. Select print command requirements as described below:

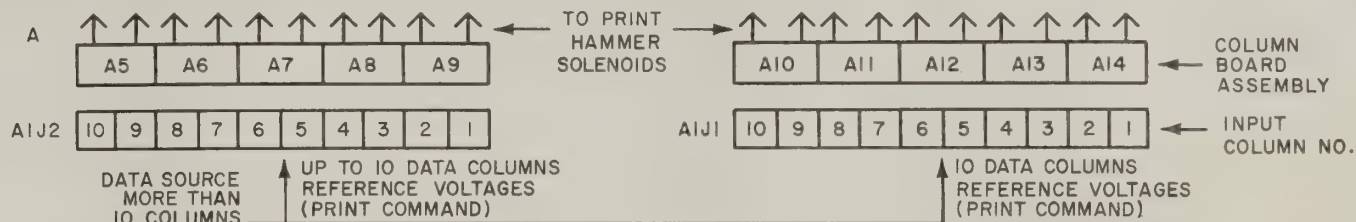
1) Standard instrument.

a) To print on command from one connector, slide print command select switch for that connector to its upper position.

Figure 2-2. Column Board Requirements



A data source having up to 10 4-line BCD columns can be connected to either input connector.* Data source must supply reference voltages and print command through this connector; inhibit signal to data source is also through this connector.



A data source having 10 to 20 columns can be connected through both input connectors.* Data source must supply reference voltages to each connector. Print command can be through either connector; inhibit signal to data source is through input connector receiving print command. Character suppression information (see Figure 2-4) is not fed from one connector to the other.

*A Column Board Assembly must be installed for each data input column from which a printed output is desired. The illustrations above indicate which column board assembly is required for each input column. Plug-in diodes and jumpers on the Column Board Assemblies allow the operator to cause certain outputs to be "suppressed" (see Figure 2-4).

- b) To require print commands from both data sources, slide both print command switches to their upper positions.
- c) Do not operate the 5050B with both print command select switches in their lower positions.
- 2) Option 50 or 51.
 - a) To print on command from either connector, slide print command select switch to its lower position.
 - b) To require print commands from both data sources, slide print command select switch to its upper position.

f. Determine voltage and frequency of 5050B ac power source. The Model 5050B can operate from either 115- or 230-volt ($\pm 10\%$), 50-60 Hz ac power. The "115/230" slide switch must be set so numbers corresponding to line voltage are exposed; a narrow-blade screwdriver is required to slide switch from one position to the other. In units with Option 55, lower front panel and set the 115/230V switch for the clock also. Be sure correct line fuse is installed (see Table 2-2). When operating from 50 Hz ac power, maximum printing rate is 16.7 lines per second, unless the standard printer drive motor pulley (HP Part No. 05050-2030) is replaced with a larger one (HP Part No. 05050-2052) to increase maximum print rate to 20 lines per second. When operating from 50 Hz power with standard drive pulley, it is necessary to change the position of the Optical Encoder Assembly to produce good printouts. Instructions for changing motor drive pulley or repositioning Optical Encoder Assembly are given in Section IV.

Table 2-1. Print Hammer Wires

Printer Column (from right)	Wire Color
1	BRN
2	RED
3	ORN
4	YEL
5	GRN
6	BLU
7	VIO
8	GY
9	WHT
10	WHT-BLK
11	WHT-BRN
12	WHT-RED
13	WHT-ORN
14	WHT-YEL
15	WHT-GRN
16	WHT-BLU
17	WHT-VIO
18	WHT-GY

Table 2-2. AC Line

Line Voltage	Fuse	115/230 Switch
115V	3.2A Slo-Blo (HP Part No. 2110-0013)	"115"
230V	1.6A Slo-Blo (HP Part No. 2110-0005)	"230"

Figure 2-3. Front and Rear Panel Controls

Item No.	Name	Function	Action Required (see Para. 2-14 thru 2-54 for setup and operating instructions)
FRONT PANEL			
1	ON/OFF Switch and Line Light	Control ac power to 5050B. Indicate ac power on.	Press to turn ac power on. Press and release to turn power off.
2	OPER Switch	Selects OPERATE or STANDBY mode.	Switch must be depressed and ac power on before print cycle can begin. May be used in either OPERATE or STANDBY.
3	MAN PRINT Switch	Cause print cycle when pressed.	Used as test switch to check operation.
4	MAN SPACE Switch	Advances paper one space (without printing) when pressed.	Increases space between data groups in printout.
5.	LOAD PAPER Light	Lights when Model 5050B is out of paper and data source is inhibited.	Load paper (see Figure 2-7).
6	Panel Latches	Hold right-hand front panel section in place.	Lift to change paper tray position or for access to paper spacing adjustment or Mechanism Assembly.
7.	Paper Tray Door	Allows access to paper storage compartment.	Pull door toward you for access to paper storage compartment.
8	Paper Spacing Control (inside)	Sets space between line.	Adjust for desired line spacing.
9	Paper Deflector	Deflects paper down into paper tray.	None required. May be removed (see Paragraph 2-46).
REAR PANEL			
10.	AC Power Connector	AC line input.	Connect power cable.
11.	115/230V Switch and Line Fuse	Select line voltage; protect against overloads.	Set 115/230 volt switch to line voltage used. Install correct fuse (see Para- graph 2-18f).
12	Input Connectors A1J1 and A1J2	Receive input from data source(s). Provide inhibit to data sources during print cycle.	Connect data sources.
13	Lock for Rear Panel Door	Lock door closed (door is shown open).	Turn knob CCW to unlock so door can be opened for access to plug-in boards.
14	Column Board Assemblies (1 to 10 req'd) A5-A14, from left to right	Compare internal binary code with input data code, provide output to drive print hammer.	Check installation of character suppression diodes and jumpers (see Figure 2-4).
15	Print Hammer Solenoid Wires	Input leads to print hammer solenoids. One for each print print hammer. Any wire may be connected to any Column Board output.	Connect wires to column board outputs so desired print format is obtained.
16	Timing Board Assembly A4	Generate timing signals and drum position code.	Required for operation.
17	Print Command Assembly A3	Accept print commands data sources, generate paper advance.	Set slide switches to determine print com- mand requirements (Paragraph 2-18e).
18	Fan	Circulate cooling air.	Avoid obstructing rear-panel openings, to allow free air flow.

Figure 2-3. Front and Rear Panel Controls

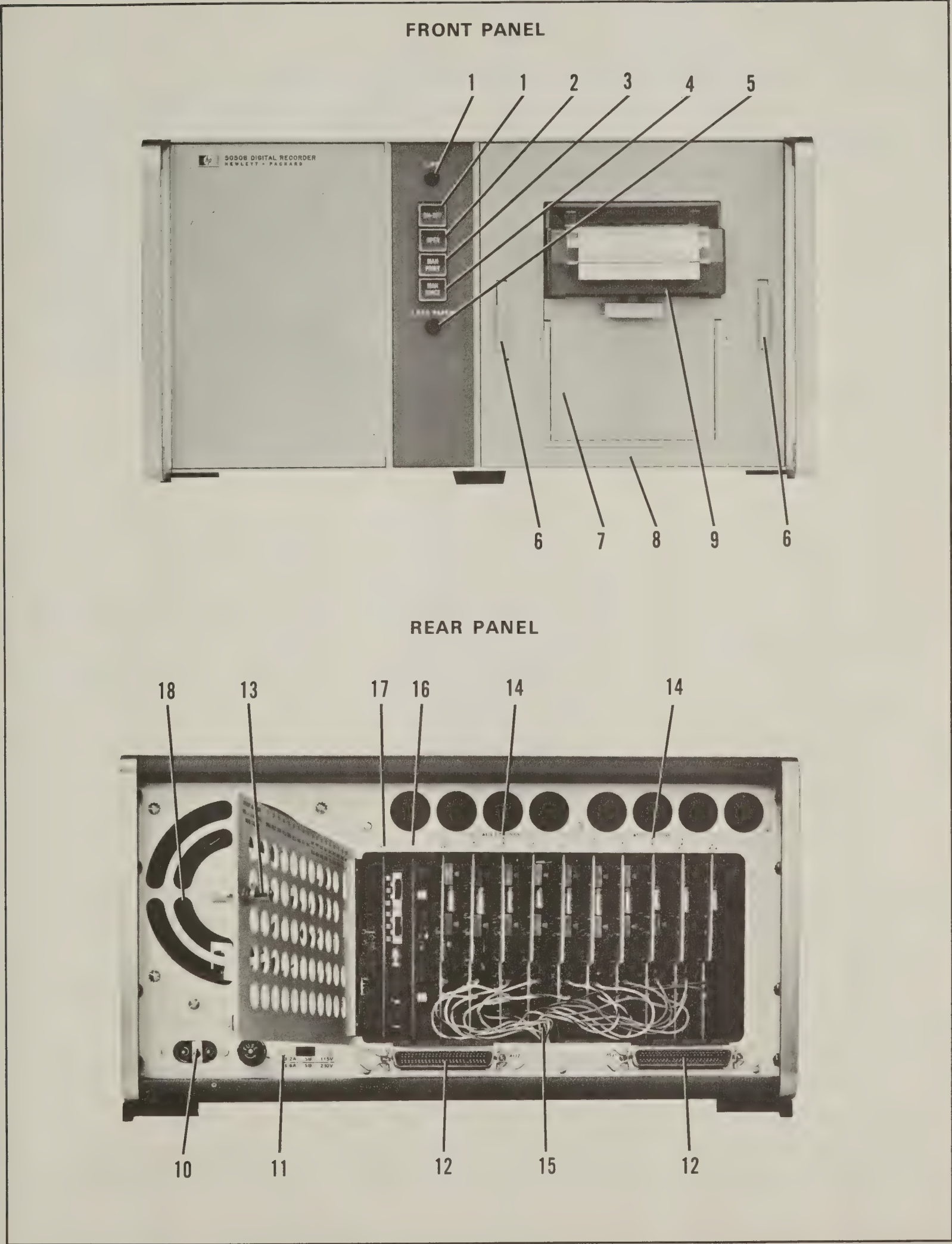
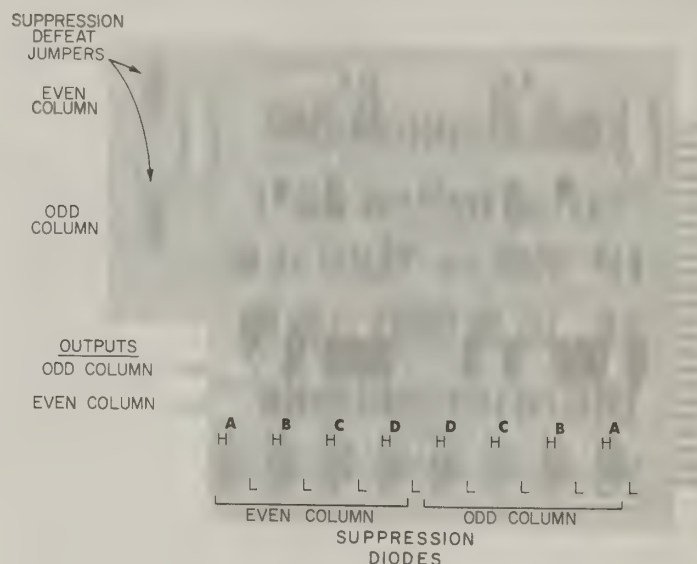


Figure 2-4. Column Board Setup

SUPPRESSION PROGRAMMING			
Standard Print Wheel Character	Code Disc		
	+1248 ^a Install diodes in positions shown ABCD	-1248 ABCD	+1224 ABCD
0	HHHH	LLLL	HHHH
1	LHHH	HLLL	LHHH
2	HLHH	LHLL	HLHH
3	LLHH	HHLL	LLHH
4	HHLH	LLHL	LLLH
5	LHLH	HLHL	LLLH
6	HLLH	LHHL	HHLL
7	LLLH	HHHL	LHLL
8	HHHL	LLLH	HLLL
9	LHHL	HLLH	LLLL
+	HLHL	LHLH	HHHL
-	LLHL	HHLH	LHHL
V	HHLL	LLHH	HLHL
A	LHLL	HLHH	LLHL
Ω	HLLL	LHHH	HHLH
*	LLLL	HHHH	LHLH



COLUMN BOARD DESCRIPTION

Handles two adjacent columns of input. "Odd" column on board is column 1, 3, 5, 7, or 9 of A1J1 or A1J2 (depending on where board is plugged in). "Even" column on board is 2, 4, 6, 8, or 10 of A1J1 or A1J2 (depending on where board is plugged in).

NOTE 1: A foil dot or triangle on the printed circuit board (or the "H" and "L" in the photograph) at each diode position indicates the cathode end of a diode correctly installed in that position. The cathode end of each plug-in diode is indicated by the diode symbol on the case.

NOTE 2: To remove plug-in diodes and jumpers without damaging them, push on contact pins from opposite side of printed circuit board, using the end of a screwdriver or long-nose pliers.

DIODE INSTALLATION INSTRUCTIONS

To suppress any one of the 16 print wheel characters:

1. Find that character's print wheel position in the table on this page.
2. In the column for the code disc being used, find the "H-L" diode arrangement for the character to be suppressed.
3. Install diodes in the "H" or "L" position for each code line as indicated in the table.

EXAMPLE: To suppress the character corresponding to the standard print wheel "5" position, when using a +1224 code disc, install the diodes in the following positions: A = L, B = L, C = L, D = H. (The same installation would suppress "7" when a +1248 code disc is used, or "8" when a -1248 code disc is used.)

To print all 16 print wheel characters from any one column (odd or even):

Install two plug-in character suppression diodes in the A = H and A = L positions for the column; the positions of the other two diodes for that column will have no effect.

SUPPRESSION DEFEAT JUMPER INSTALLATION INSTRUCTIONS

Put the suppression defeat jumper for any column in its upper position if the "suppressed" character in that column is to be printed when there is an output from the next higher-numbered column. Put the jumper in its lower position when the "suppressed" character is to be "suppressed" at all times.

Figure 2-5. Column Board Setup (Example)

GENERAL

1. Input data source is a HP Model 5245L Electronic Counter.
2. Input data for each column is:

5050B Column	5245L Column
1 through 8	10^0 through 10^7 data information
9	Measurement units information
10	Decimal point information
3. Five 5050B column boards are available, for 10-column capacity.

LOGIC

1. There are three basic information groups, each independent of the others.
2. In decimal point and measurement units information groups (one column each), any output from the 5245L is significant and should be printed.
3. In data information group, a "0" in any column except 10^0 is not significant, unless the number in the next higher-order column is not zero.

SETUP

1. 5050B column 10 No suppression
2. 5050B column 9 No suppression
3. 5050B column 8 Suppress "0" (see Figure 2-4); place suppression defeat jumper for this column in its lower position, making suppression independent of column 9.
4. 5050B columns 7 through 2 Suppress "0" in each column. Place suppression defeat jumpers for these columns in their upper positions, making suppression program in each column dependent on preceding column (through column 8).
5. 5050B column 1 No suppression (see Figure 2-4). Allows "0" to be printed when that is output of this column, regardless of inputs to columns 2 through 8. A 5245L display that is all "zeroes" will blank all zeroes, except the last one, in the 5050B output. Suppression defeat jumper may be in either position.

APPLICATION

The above example illustrates use of all columns at one 5050B input connector. Where there are fewer data information columns, or different numbers to be suppressed (as with the HP Model 5216A 12.4 MHz Counter), the same logic is used in arriving at the correct column board setup, except that fewer boards are required. For equipment other than counters, the logic is the same: know the data source output; install suppression programming diodes as required; install suppression defeat jumpers in their upper positions for all columns except the most significant column in each information group. Install column boards in 5050B.

The larger pulley for 50 Hz operation may be ordered factory-installed as Option 10.

The 5050B is equipped with a detachable 3-wire power cable (HP Part No. 8120-0078); connect flat-connector end to instrument ac line connector; connect other end to a 3-wire (2-blade with round grounding pin) grounded outlet. For safety, exposed portions of instrument are grounded through power cord ground lead; when only a 2-blade outlet is available, use an adapter (HP Part No. 1251-0048), and connect short wire from side of adapter to ground.

g. Be sure that data source code, reference, and print commands are within specifications for 5050B input (see Table 1-1 and Paragraphs 2-19 through 2-26), then connect data sources. This completes the rear-panel setup procedure.

2-19. Input Code and Reference Voltage Selection

2-20. GENERAL.

2-21. All input code voltages at one input connector (A1J1 or A1J2) are referred to the reference voltages at that connector. The discussions below describe the code and reference voltage limits and how to select reference voltages for both standard (non-storage) and Option 50 or 51 (data storage) instruments. Most Hewlett-Packard digital data instruments supply the required code and reference voltages without modification.

2-22. INSTRUMENTS WITHOUT DATA STORAGE.

2-23. Select code and reference voltages that are within the limits specified below:

a. Maximum voltage to ground (code or reference): ± 150 volts.

b. Minimum code voltage difference: 4.5 volts. (Difference is measured between most positive "L" and most negative "H" levels connected through input connector.)

c. Maximum code voltage difference: 75 volts.

d. Minimum reference voltage difference: 4.5 volts. (May be reduced to zero, if character suppression is not required.)

e. Relation of reference voltages to code voltages:

1) When reference voltage difference is less than 5.6 volts:

a) H REF may not be more than 0.5V more positive than any H CODE level.

b) L REF may not be more than 0.5 V more negative than any L CODE level.

2) All H CODES must be at least 4.5V more positive than L REF.

3) All L CODES must be at least 4.5V more negative than H REF.

2-24. Where possible, reference voltages should be taken from data source power supply voltages; power supply voltage variations will then be reflected proportionately in the data and reference levels. When

reference voltages are supplied from another source, be sure they will meet all requirements of Paragraph 2-23. A reference voltage clamp circuit (shown in Figure 7-4, sheet 3) for each input connector limits the maximum reference voltage difference seen by the Column Board Assemblies to 5.6 volts, and centers this voltage between the input reference voltages.

2-25. INSTRUMENTS WITH DATA STORAGE OPTIONS.

2-26. The reference and code voltages at each connector may be selected for one of three situations, listed below.

a. For use with most HP instruments (both reference voltages provided at input).

1) No adjustment is necessary. The instrument should provide correct code and reference voltages to the 5050.

2) Input code and reference voltages must not be more than ± 50 volts from 5050B chassis ground.

3) Input code and reference voltage relationships:

a) Any H CODE level must be more positive than $L\text{ REF} + 0.35 (H\text{ REF} - L\text{ REF}) + 1.4V$, and must be able to supply $> 80\ \mu A$.

b) Any L CODE level must be more negative than $L\text{ REF} + 0.35 (H\text{ REF} - L\text{ REF}) + 0.2V$.

c) EXAMPLE: The data source is a HP Model 5245L; its reference voltage outputs are: $H = +17V$, $L = -6.5V$.

The lowest H CODE level is $-6.5V + 0.35 (+17V + 6.5V) + 1.4V = +3.1V$.

The highest L CODE level is $-6.5V + 0.35 (+17V + 6.5V) + 0.2V = +1.9V$.

b. For instruments providing only one reference (L REF). Optimized for T^2L logic.

1) No adjustment is necessary.

2) Input code and reference voltages must not be more than $\pm 20V$ from 5050B chassis ground.

3) Input code and reference voltage relationships:

a) Any H CODE level must be more positive than $L\text{ REF} + 2.1V$, and must be able to supply $> 80\ \mu A$.

b) Any L CODE level must be more negative than $L\text{ REF} + 0.9V$.

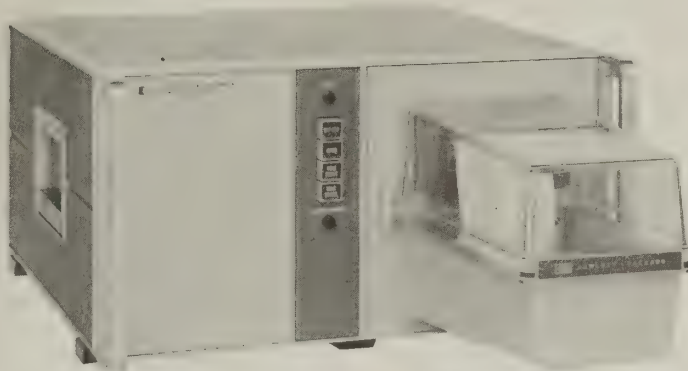
c. For optimum noise margin for systems not covered in situations a or b (for example, where code and reference voltage limits cannot be met by data source).

1) Adjustment of A1R41 is required. For access to this adjustment, remove 5050B bottom cover (see Section IV).

2) Input code and reference voltages must not be more than $\pm 5V$ from 5050B chassis ground.

3) Input code and reference voltage relationships:

Figure 2-6. Paper Hopper



The paper hopper, with its cover in place (see Figure 1-1) is an important part of the Model 5050B noise reduction system. For quietest operation the paper hopper should be installed in its "out" position with its cover in place.

The paper hopper assembly consists of two parts: 1) the right-hand front panel section and paper tray assembly ("tray"), and 2) the transparent cover section ("cover"). The Model 5050B is shipped with the paper hopper in its "in" position below the Mechanism Assembly. To change paper hopper from its "out" or "in" position to the other position:

- a. Release right-hand front panel section by lifting plastic levers (items 6, Figure 2-3) at each side.
- b. Remove panel section from Model 5050B, turn it around, and replace it in frame. Be sure panel section is properly seated before locking into place.
- c. Lock panel section in place by pulling down on plastic levers at sides.

Wide ridge of paper hopper slides over ridge of tray in either "out" or "in" position. The cover can also be stored inside the 5050B (below mechanism) in "tray out" position.

- a) Adjustment allows lowest H CODE level to be set from L REF +2.1V to H REF +1.4V. Any H CODE level must be able to supply at least 80 μ A.
- b) Any L CODE level must be more negative than H CODE level - 1.2V.

2-27. Mechanism Setup

2-28. ACCESS TO MECHANISM.

2-29. For access to Mechanism Assembly (to install or remove inked roller, change code disc, or perform maintenance or adjustment procedures of Section IV), proceed as follows:

- a. Turn off instrument power.
- b. Release right-hand front-panel section by lifting plastic levers (items 6, Figure 2-3) at each side.
- c. Remove front-panel section from instrument.
- d. Pull Mechanism Assembly far enough forward to allow access to inked roller, code disc, or adjustment. Lift front of mechanism slightly as you pull it, to release it from stops that hold it in instrument.

e. After performing required installation, adjustment or maintenance, push mechanism assembly as far into instrument as it will go. Replace front-panel section removed in step c, and lock section in place by pulling down on plastic levers at sides. This front panel section contains the paper hopper, which can be mounted in either of two positions (see Figure 2-6).

2-30. INKED ROLLER INSTALLATION.

2-31. The Model 5050B is shipped without the inked roller installed; the roller is required only when standard paper is used, and should be removed if pressure-sensitive paper is to be used (see Paragraph 2-42). The inked roller should be replaced when printing on standard paper becomes too light or when it becomes so worn that pieces stick to print drum, causing poor quality of prints (see Figure 4-2). Handling the inked roller can be messy, but by using reasonable care and following the instructions below, the job can be done neatly.

2-32. For access to the roller, remove the Mechanism Assembly as described in Paragraph 2-29. Assemble inked roller and bearings on shaft as shown in Figure 5-1; then, using two long-nose pliers push inked roller assembly down and forward in its guides in

Mechanism Assembly side castings so springs at the sides hold it against print drum. Push mechanism back into instrument and replace front-panel section (see Paragraph 2-29e). Installing inked roller may cause print drum to turn more slowly, causing bottoms of printed characters to be missing or lighter than tops; this can be corrected by timing adjustments described in Section IV.

2-33. To remove inked rollers, remove Mechanism Assembly from Model 5050B as described in Paragraph 2-29. Using two long-nose pliers, grasp bearing at each end of roller shaft and push or pull it back and up in guides, against the tension of the spring. Be careful not to lose the bearings as the roller is lifted out of the Mechanism Assembly. Inked rollers and bearings generally fit loosely on shafts, so little effort is required to remove or install them.

2-34. CODE DISC.

2-35. Code discs for the +1248, -1248, and +1224 codes (see Table 1-1 for truth tables) are included with the basic Model 5050B. Ordinarily, the code disc required for initial use is installed when the instrument is shipped. The code disc installed in the mechanism assembly determines the input code-to-printed-character relation for all data input columns, and must be changed if the input code changes, with the following restrictions:

a. Both data sources must have the same input code.

b. Standard print wheels must be installed in all printer columns.

c. In instruments with special print wheels, the table in Figure 2-4 and the special manual insert pages should be used to determine the effect of changing the code disc.

2-36. The code disc is attached to the right-hand side of the print drum shaft. To change discs, slide Mechanism Assembly out of 5050B (see Paragraph 2-29). Hold pulley on print drum shaft to prevent shaft from turning, so screw holding disc in place can be loosened. Remove disc by removing screw holding it to print drum shaft (see Figure 5-1); then remove disc from shaft end.

CAUTION

Never apply power to Model 5050B if a code disc is not installed in printer mechanism or if disc is prevented from turning (either by removal of a drive belt or by otherwise stopping the print drum shaft).

2-37. When installing a code disc, set disc on right-hand end of print drum shaft with identifying numbers (HP Part No. and disc code) visible from right-hand side of the Mechanism Assembly (see Figure 7-10). The "D"-shaped center hole in disc must be aligned with the "D"-shaped key at end of shaft. Use a 4-40 screw (HP Part No. 2230-0024) to hold the disc on the shaft. There is some clearance in the fit of the code disc on the shaft, allowing differences in angular alignment between discs and print drum charac-

ters. If printed characters are not even (heavier printing at top or bottom), reposition disc slightly or adjust position of the Optical Encoder Assembly (see Section IV). After installing new disc, replace Mechanism Assembly in the 5050B and replace front panel section as described in Paragraph 2-29e.

2-38. Paper

2-39. GENERAL.

2-40. The Model 5050B is shipped with one pad of standard paper (which requires use of the inked roller) and one pad of pressure-sensitive paper (no inking required). Order replacement paper by HP Part No. listed in Table 1-2D. When changing from one type of paper to another, printed characters may become darker at top or bottom because inked roller changes printer motor speed slightly; to improve printout appearance, adjust timing as described in Section IV.

2-41. STANDARD VS PRESSURE-SENSITIVE PAPER.

2-42. An inked roller is required when standard paper is used in the Model 5050B; the roller is not required for pressure-sensitive paper. The inked roller has enough ink for 100,000 to 200,000 prints, depending on operating temperature (roller dries out more quickly at higher temperatures); this represents approximately 12 pads of paper printed with minimum line spacing. At maximum print rate (1200 lines per minute), inked roller can be expected to last about 2 to 3 hours. Also, inked roller (especially when new) may splatter some ink, which can collect on paper when print rate is low, obscuring printout. Recommended usage of standard versus pressure-sensitive paper is given below. Additional information about inked roller is given in Paragraph 2-30. When using slow printing rates, Option 15 will eliminate ink problems and extend inked roller life.

2-43. Standard paper is recommended:

a. When very clear, sharp printing is desired.

b. When permanent records are required. Pressure-sensitive paper can be marked by creasing, abrasion, etc., so the record can be changed unintentionally.

c. When printing load is moderate to heavy (printer not idling for long periods). When printer is idling, with an inked roller installed, ink can be deposited on the paper and inked roller wears out from its constant contact with print drum.

2-44. Pressure sensitive paper is recommended:

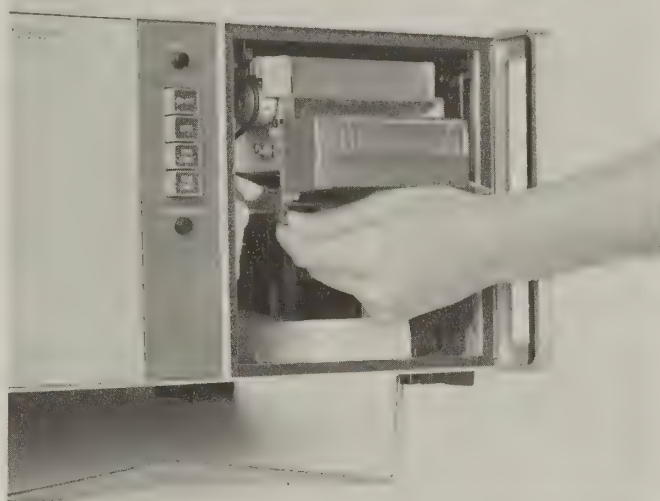
a. When operating at temperature extremes (below +10°C or above +40°C).

b. When ink splatter is undesirable.

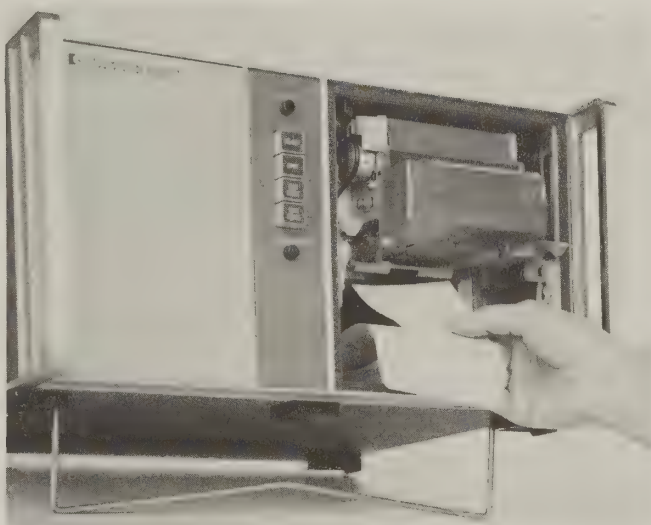
c. When printer is idling for long periods (motor running constantly, but printout rate is slower than once per 10 seconds).

2-45. Instructions for paper installation are given in Figure 2-7.

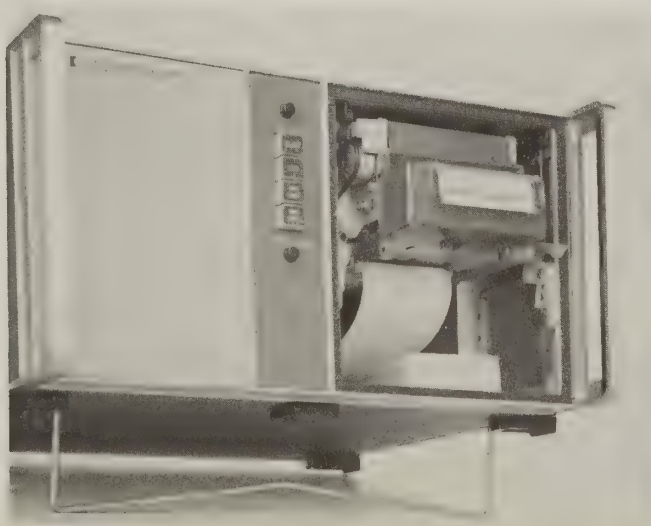
Figure 2-7. Paper Installation



A



B



C

PAPER INSTALLATION

Paper can be installed with the tray "in" or "out" (the cover must be removed when the tray is "out".) The door at the panel end of the tray (Item 7, Figure 2-3) must be pulled toward you (whichever way tray is installed) for access to the paper compartment. The easiest way to load paper, however, is to remove the entire right-hand front panel section as described in Figure 2-6.

With paper storage compartment door opened (pulled toward you), or right-hand front panel section removed:

a. Pull paper brake release lever down and to your right so it is detented in its lower position. This lever is the "L"-shaped metal piece at lower left-hand front corner of the Mechanism Assembly.

b. With paper brake released, put paper pad in paper storage compartment and slide upper end of paper through paper guide at the bottom of Mechanism Assembly. Continue pushing paper through guide until you can see it coming out at front of mechanism.

NOTE

One side of pressure-sensitive paper is more sensitive than the other. The more sensitive side can be determined by marking both sides using a thumbnail and noting which side has the darker mark. The paper should be installed so the more sensitive side is on top as the paper comes out of the 5050B.

c. Re-engage paper brake by pushing the "L" paper brake release lever to the left so it disengages from its detent position. The brake lever normally returns to its "brake engaged" position when the right-hand front panel section is installed and the paper tray door is closed.

If the steps of Paragraphs 2-18 have been performed, the instrument is now ready for operation.

2-46. PAPER DEFLECTOR.

2-47. The clear plastic Paper Deflector (item 9, Figure 2-3) improves folding and storage of printed output tape in the paper tray. The rectangular hole in the top of the deflector allows the operator to write on the tape as it comes out of the printer. The paper deflector is not installed when the 5050B is shipped. To install the paper deflector:

a. Set deflector on top of hammer guard at front of Mechanism Assembly. Front of paper deflector should curve down, around front of hammer guard.

b. Gently push paper deflector (into Mechanism Assembly until rear of deflector snaps into place in holes provided in top of the hammer guard. Deflector is held in place by two fingers on top pressing against the paper output opening. To remove paper deflector from Mechanism Assembly, gently push front of deflector down and to rear with thumb; at the same time, grasping deflector with fingers and lifting it up and out from hammer guard.

2-48. OPERATION

2-49. Before turn-on be sure the 5050B is correctly set up for your application.

CAUTION

To protect Column Board Assembly output fuses, the OPER switch should always be in its "out" position before ac power is applied.

To protect LASCRs in Mechanism Assembly, power should not be applied unless:

1. The code disc is installed.
2. Both Mechanism Assembly drive belts are installed.
3. The code disc will rotate when power is applied.

2-50. Turn the Model 5050B "on" by pressing the ON/OFF pushbutton (Item 1, Figure 2-3). The switch will latch in its "in" position, and the LINE lamp will light.

2-51. Press MAN SPACE pushbutton (Item 4, Figure 2-3) to advance paper without printing; for instance, to separate datagroups in the printout. Paper advances one space each time pushbutton is pressed.

2-52. Use the MAN PRINT pushbutton as a "test" switch, or to generate a printed line independently of data source print commands (unless a print cycle is in progress. When the MAN PRINT pushbutton is depressed, the data sources are inhibited during the time required for data transfer (50 msec, std; 100 μ sec, with data storage), unless a print cycle is in progress. When the MAN PRINT is manually held in its depressed position, it duplicates the function of the OPER switch, and print cycles can be initiated by data source print commands.

2-53. Paper spacing control R2, located behind removable right-hand front-panel section, determines space between printed lines. To change this spacing, remove right-hand front-panel section and use a screwdriver or alignment tool to turn the potentiometer to get desired spacing; use MAN PRINT pushbutton to generate printed lines. Line spacing can be varied between 3.5 and 4.5 lines per inch (see Figure 1-2).

2-54. When paper supply is exhausted, the LOAD PAPER lamp (Item 5, Figure 2-3) lights, and the print cycle is interrupted. Data sources remain inhibited until paper is installed. It is not necessary to turn off Model 5050B power while changing paper, but it is advisable to put instrument in its STANDBY mode by pressing and releasing OPER switch so it returns to its "out" position. Instructions for loading paper are given in Figure 2-7.

2-55. OPERATOR'S MAINTENANCE

2-56. In general, the only maintenance required is cleaning the print drum, removing paper dust and replacing the inked roller when necessary. The print drum can be cleaned with any standard typewriter cleaner; the inked roller should be removed, and paper placed under the print drum to prevent any foreign matter from falling into the hammer bank below the drum. Paper dust can be removed by brushing it out with a soft brush.

SECTION III

PRINCIPLES OF OPERATION

3-1. GENERAL

3-2. Operating Modes

3-3. The Model 5050B has two operating modes:

a. Idling, while start gate is closed, waiting for print commands; and

b. Print cycle, when print drum position codes are compared to input signal codes and printed outputs made. The waveforms shown in Figure 3-1, are keyed to the test point locations shown in Section VII and are intended as an aid to understanding operation.

3-4. Idling

3-5. The OPER switch may be in either position. During normal idling operation, when the switch is depressed, before print commands arrive, the following events happen continuously:

a. Printer motor A15B1 turns the print drum and code disc.

b. The start gate is closed, awaiting negative-going signals from both print command flip-flops.

c. The 16 holes at outer edge of code disc allow light to strike timing LASCRA (A15A1CR5) 16 times during each print drum revolution. The timing LASCRA controls the timing signal generator, and the timing signal and inverted timing signal (Figure 3-1B) are generated.

d. The four inner rows of holes in the code disc allow light to strike the code LASCRA (A15A2CR4-A15A2CR1), providing a binary-coded drum position signal to code gates on A4 (Figure 3-1D-G). The code shown is +1248*; for other codes, the same code arrangements appear, except they are in different orders. The code disc allows light to strike the code LASCRA about 1 msec before the timing LASCRA is activated in order to allow the code gates on A4 to be properly set up before the timing pulse (Figure 3-1B) is generated. The code gate outputs are shown in Figure 3-1D-G.

e. After a short delay, each timing signal pulse turns off all conducting LASCRA.

3-6. Print Cycle

3-7. The OPERATE or MAN PRINT switch must be depressed. The print cycle mode of operation begins when both print command flip-flops are in their "set" state, and the start gate opens. The following events occur in the print cycle mode:

a. The last print command flip-flop to switch to its "set" state opens the start gate, generating a signal (Figure 3-1H) that begins a holdoff period of about 13 milliseconds. At the end of the 13-millisecond delay, the timing signal gate opens (Figure 3-1I). The end of the holdoff period is synchronized to the timing signal, so the holdoff time may not be exactly 13 msec. The print command flip-flops generate inhibit signals which are connected to the data sources to keep them from changing their outputs to the data sources to keep them from changing their outputs to the Model 5050B during the print cycle.

b. When the timing signal gate opens, the timing signal (Figure 3-1I) is fed to the timing signal counter on A4 and to the column boards A5-A14. This signal is the gated timing signal.

c. The timing signal gate remains open until the timing signal counter has received 16 input pulses, indicating that the print drum has made one complete revolution and all possible drum position codes have been compared against the input data, and all printing has occurred. At the count of 16, the paper advance gate opens and the inverted timing signal causes the signal shown in Figure 3-1J; the negative-going slope has no effect, the positive-sloping part drives the paper advance one-shot.

d. The paper advance one-shot output (Figure 3-1K) drives the paper advance solenoid and resets the print command flip-flops, which in turn close the start gate. The inhibit off delay circuits maintain inhibit outputs to the data sources for approximately 150 microseconds after the print command flip-flops are reset. The distance the paper is advanced is determined by the duration of the paper advance pulse. The negative-going spike at the end of this pulse is used to reset the control flip-flops for each data column of the Column Board Assemblies.

e. For this example, assume that the binary-coded input data for one Column Board is one that forward-biases character suppression gate diode CR5 and allows the gated timing signal to get to the timing signal inverter for that column, causing inverted timing signals to be generated.

f. The code gate outputs (Figure 3-1E-H) indicate which row of characters on the print drum is coming into "print" position above the print hammers. These signals are differentiated and connected to the code comparison gate of each data input column. The code comparison gate output is a series of differentiated gated timing signal pulses (only positive spikes are significant) and a line of inverted gated timing signal pulses (only negative spikes are significant). Positive and negative spikes occur at the code comparison gate

*A=1, B=2, C=4, D=8, "1" state is positive (1=H, 0=L).

output only when the drum position code matches the data input code, indicating that the print drum character above the print hammer in the printer column connected to that data column is to be printed.

g. The coincident positive and negative spikes at the coincidence gate inputs cause an output which sets the control flip-flop, triggering the solenoid driver to energize the print hammer solenoid connected to the output pin for that column (see Figure 3-1L). The print hammer solenoid is energized only during the first timing pulse that occurs when the control flip-flop is switched to its "set" condition. The print hammer solenoid is turned off by the inverted timing signal through the SCR reset circuit.

h. Energizing the print hammer solenoid causes the print hammer for that column to strike the paper, pressing it against the character above it on the print drum at that time, making a print.

i. The column board control flip-flops are reset by the inductive kick of the paper advance solenoid at the end of the paper advance one-shot output pulse (Figure 3-1K), ending the print cycle.

k. When the paper supply is used up, the paper out switch contacts close, lighting the LOAD PAPER light and disabling the timing LASCOR output. Disabling the timing LASCOR output prevents the timing signal counter from completing its 16 counts, so data source(s) remain inhibited (see steps d and e) until more paper is installed and the print cycle is completed.

3-8. ASSEMBLY FUNCTIONS

3-9. The functions of each 5050A assembly are described on the fold-out page facing the schematic for that assembly in Section VII.

Figure 3-1. Waveforms



SECTION IV MAINTENANCE

4-1. RECOMMENDED EQUIPMENT

4-2. Equipment recommended for maintenance, troubleshooting, adjustment, and performance checking the Model 5050B is listed in Table 4-1. Mechanism Extender and Extender Board Assembly called out in these procedures are part of Service Kit (HP Part No. 05050-6023).

4-2. PREVENTIVE MAINTENANCE

4-3. In general, the only preventive maintenance required is cleaning the print drum and removing paper dust. Interval between cleanings depends on type of paper used and amount of printing done. With pressure-sensitive paper, only cleaning required is to brush out paper dust after every tenth pad of paper. Cleaning interval with standard paper and ink roll depends on amount of printing done, as listed in Table 4-2.

4-4. ADJUSTMENTS—ELECTRICAL

4-5. General

4-6. Electrical adjustments in standard Model 5050B are: 1) paper spacing (R2); and 2) -50V supply. In Option 50 or 51 5050B, adjustment of internal reference voltages to column board assemblies can also be made. Paper spacing adjustment is described in Paragraph 4-16. Option 50 and 51 reference adjustments are described in Paragraph 2-26.

4-7. -50V Supply

4-8. Important for proper timing (Paragraph 4-12). Measure voltage between A16(16, T) and ground. Adjust A16R7 for $-50V \pm 0.1V$.

4-9. ADJUSTMENTS—MECHANICAL

(Adjustment locations: Figure 7-10).

4-10. General

4-11. Mechanical adjustments are: 1) Timing (for best printout appearance); 2) Paper spacing; and 3) Paper guard (harp string) adjustment. Some of these adjustments are critical, and none should be attempted without understanding effect of adjustment to be performed. Figure 4-2 shows sample tape outputs indicating which adjustments are needed. Adjustment locations are indicated in photos in Figure 7-10. Before making any adjustment, make a sample tape so effect of adjustment can be noted.

4-12. Timing Adjustments

4-13. Need for timing adjustment is indicated by characters being unevenly printed, light or incomplete at top or bottom. When poor printing of this sort occurs in most columns, it should be corrected by adjusting optical encoder assembly; when poor printing of this sort occurs in a few columns, it should be corrected by adjustment of individual hammers. Timing

adjustment can be upset by: 1) changes in print drum speed, due to line voltage or frequency changes or installation or removal of ink roller; 2) differences between code discs and their installation when changing from one code to another, 3) aging of electronic components, and 4) wear of mechanical parts.

4-14. Timing adjustment is made by moving optical encoder assembly to give best print for all numbers in all print columns, as described in Paragraph 4-15. Adjustment locations are indicated in Figure 7-10. Some points to keep in mind are:

a. Code disc turns CCW, when viewed from right-hand side of Mechanism Assembly.

b. Code holes for any drum position allow light to strike code LASCRs before timing hole for that position allows light to strike timing LASCR.

4-15. Make timing adjustments as follows:

a. Remove Mechanism Assembly from 5050B (instructions, Paragraph 2-29).

b. Plug Mechanism Extender on rear of Mechanism Assembly.

c. Install Mechanism Assembly and extender in 5050B. The 5050B can now be operated with timing adjustments accessible.

d. Print a sample tape (3 or 4 lines of different figures in each column, particularly "3", "5", "6", "8", "9", "0"). Note whether printing is ok, or whether timing should be advanced or retarded (see Figure 4-2). For these adjustments, be sure to use same type of paper that will be used in 5050B operation (see Paragraph 4-13).

e. If printout is good, no further adjustments are necessary. If printout is poor continue adjustment procedure.

f. Slightly loosen two screws (item B, Figure 7-10, Sheet 2) attaching optical encoder mounting plate to right-hand side casting.

g. Using a 3/8-inch wrench, rotate eccentric mounted on lower screw loosened in step f to move optical encoder assembly as required. This step can be performed with printer operating. Moving encoder assembly up retards timing, down advances timing.

h. When best printing is achieved in most columns, tighten screws loosened in step f. Make another sample tape before removing mechanism and extender from 5050B. If printout from one (or a few) column(s) cannot be improved by timing adjustments described above, continue adjustment procedure.

Table 4-1. Recommended Test Equipment

Description	Recommended Instruments	Use
Data source(s) Capable of providing 4-line binary coded signals in +1248, -1248, or +1224 code.	Electronic counters, Digital voltmeters	1, 2, 3
DC Voltmeter/Ohmmeter Voltage range: 0 to 100 volts Resistance Range:	Model 412A	2, 3
Oscilloscope Frequency response: dc-5 MHz Vertical sensitivity: V/cm to V/cm Dual channels desirable External sync capability required	Model 175A with Model 1750B Dual Trace Vertical Plug-in and 1780A Auxiliary Plug-in	2, 3
Oscillator To provide various outputs when counter is used as a data source.	Model 651A	1, 2, 3
Tools (special)		
Retainer Ring Pliers (external)		
Hex Wrench (Socket)	3/16-inch, 3/8-inch	3
1; Performance Check; 2: Troubleshooting; 3: Adjustment.		

Table 4-2. Cleaning Interval with Standard Paper

Cleaning Required	Printing Rate	
	High to Medium (20 lines/second to 5 seconds/line)	Low (5 seconds/line to 500 seconds/line)
Replace ink roll, clean ink roll shaft and bushings	When printout is too light (100,000 to 300,000 printed lines)	After 350 hours of operation
Clean print drum	As required	As required
Brush out paper dust	As required	Every 10 pads of paper
Clean ink guard	As required	As required
PROCEDURE: 1. Remove mechanism from 5050B (instructions, Paragraph 2-29). 2. Remove ink roll cover. 3. Clean ink guard (alcohol is recommended as solvent). 4. Remove ink roller (instructions, paragraph 2-33). 5. Clean ink roller shaft and bushings. 6. Oil bushings using a light machine oil. 7. Clean print drum. Use any standard typewriter cleaner. Have paper under print drum to prevent foreign matter from falling into print hammer bank below drum. 8. Brush out paper dust, using a soft brush. 9. Install ink roller (instructions, Paragraph 2-32). 10. Install ink roll cover. 11. Install mechanism in 5050B (instructions, Paragraph 2-29).		

i. Turn off 5050B power and remove mechanism assembly from extender.

j. Turn Mechanism Assembly upside-down.

k. Remove two screws holding bottom of hammer cover and entry guide in place. Remove entry guide by sliding it back, into plastic paper guide assembly, then pulling it up and forward.

l. Plug Mechanism Assembly into extender in 5050B.

m. Turn on 5050B power.

n. Using a 3/16-inch socket wrench, turn print hammer for poor-printing column to obtain best appearing printout.

o. When adjustments are complete, turn off 5050B power, remove mechanism and extender, replace entry guide (removed in step k), and replace mechanism in 5050B.

4-16. Paper Advance Assembly Adjustments

4-17. These adjustments assure proper paper spacing control range, and compensate for wear in the paper advance system. If paper does not advance, or paper spacing is not uniform for any paper spacing control setting, first check paper advance one-shot output pulse from A3; if pulse length is uniform, perform the following adjustment procedure.

a. Turn off 5050B power and remove Mechanism Assembly.

b. Loosen 4 screws (items F, Figure 7-10) attaching paper advance assembly to side castings.

c. Plug mechanism into extender and extender into 5050B.

d. Turn on 5050B power and have mechanism print; and advance paper, at a slow rate.

e. Lower front of paper advance assembly until paper advances evenly, using 3/8-inch wrench to turn eccentric on front mounting screw on right side casting (loosened in step b).

f. Tighten all screws loosened in step b.

g. Check paper advance control range. Minimum spacing is 4.5 lines per inch, maximum spacing is 3.5 lines per inch. If paper spacing control cannot adjust spacing to these limits:

- 1) Turn off 5050B power and remove mechanism assembly from printer.
- 2) Loosen screws (items G, Figure 7-10) holding paper advance solenoid in place.
- 3) Place a 0.010-inch shim between paper advance solenoid core and armature.
- 4) Pinch shim between armature and solenoid and move this assembly toward front of mechanism to decrease spacing between printed lines or rearward to increase spacing.

- 5) Tighten screws loosened in step 2 and check maximum and minimum paper spacing limits. Repeat adjustment, if necessary.

4-18. Paper Guard (Harp String) Adjustment

4-19. The paper guard (harp string) is a ladder-shaped plastic device (see Figure 5-1, item 63) that keeps the paper from contacting the print drum, except when and where print hammers strike. Harp string readjustment is needed when there is "ghosting" (fading printing of numbers in adjacent columns, due to paper bowing and contacting more than one print wheel when struck by a print hammer), when printout is faint or missing because paper is being held too far away from print drum by paper guard, or when paper smudges due to accumulation of ink from print drum when printer idles for long periods between prints. Adjust paper guard as follows:

a. Turn off 5050B power and remove mechanism from 5050B.

b. Loosen screws (items M, Figure 7-10) holding front of harp string, and push harp string as far rearward in mechanism as possible. Tighten these screws.

c. Connect mechanism to 5050B through extender.

d. Rear of harp string is supported at each side by a nylon eccentric (items E, Figure 7-10). Eccentrics are adjusted by screwdriver. "High" side of eccentric is indicated by a raised dot next to screwdriver slot. When dot is at its highest position, rear of harp string (on that side) is at its highest position; when dot is at its lowest position, rear of harp string is at its lowest position. Adjustment is strictly one of position; neither eccentric should be "tightened" against harp string, as this may warp harp string.

e. Adjust harp string position, using nylon eccentrics, so paper is high enough for good printing in all columns but not so high that it picks up ink from print drum while printer is idling.

4-20. PARTS REPLACEMENT

4-21. Mechanism sub-assemblies (hammer bank, print drum, paper advance assembly) are independent. Any one assembly may be repaired or replaced with minimal effect on other parts or adjustments. When work is required on more than one sub-assembly, work on only one at a time, completing tests and adjustments before beginning on the next. Before making any adjustment or parts replacement, run a sample tape so effect of adjustments can be noted. When replacing parts, take care to disturb as few adjustments as possible; this will make it easier to achieve good printouts when parts replacement is completed.

4-23. Hammer Bank Assembly

4-24. The Hammer Bank Assembly includes 18 print hammers, the casting on which they are mounted, hammer adjustment screws, wiring, and connector P2. Order assembly by description, there is no HP Part Number. Assembly is tested before shipment.

CAUTION

Never place a hammer bank assembly upside-down on any surface. Tops of hammers are approximately 1/64-inch higher than top of assembly casting, and could be put out of alignment. When working on hammer bank assembly, support it by mounting it in mechanism assembly or clamping it by sides in a vise (be sure not to damage alignment pins when doing this).

4-25. To replace hammer bank assembly:

a. Turn off 5050B power and remove Mechanism Assembly.

b. Remove P2 from rear of mechanism. Do not disconnect cable. Pass P2 between printer motor and right-hand side casting. Remove clamp holding cable.

c. Remove four screws holding hammer cover at front of mechanism.

d. To make alignment easier when installing hammer bank, mark eccentrics and side plates to indicate eccentric positions before removing screws that attach hammer bank to side casting.

e. Turn Mechanism Assembly upside-down. Remove three screws that attach hammer bank to each side casting.

f. Lift hammer bank from mechanism. Move brake release arm as required to clear hammer bank. Be careful not to place hammer bank upside-down on any surface.

g. Install hammer bank assembly, reversing procedure above. As a start in correctly aligning hammer bank, place eccentrics in position indicated by markings of step d.

h. Print a test tape to determine need for further adjustment. Since other mechanism adjustments were not changed during this procedure, it should be possible to get a good printout by adjusting hammer bank distance from print drum by using eccentrics on hammer bank mounting screws.

4-26. Individual Print Hammers

4-27. Individual replacement print hammers are available by ordering HP Part No. 05050-6022; the replacement hammer assembly is complete (including solenoid and wiring to connector P2), and is tested before shipment. To replace an individual hammer:

a. Turn off 5050B power and remove Mechanism Assembly from instrument.

b. Remove four screws (items C, Figure 7-10) holding hammer guard. Remove hammer guard.

c. If hammer to be replaced is odd-numbered, it is mounted at front of hammer bank assembly and no further disassembly is required. If hammer to be replaced is even-numbered, it is mounted at rear of hammer bank assembly and assembly must be removed before proceeding (see Paragraph 4-24).

d. Hammer cores are held in place by metal strips at front and rear of hammer bank assembly. To remove an individual hammer, loosen two screws (items J, Figure 7-10) holding metal strip nearest hammer to be removed; note that this allows at least two other hammers to be moved; be careful not to jar these other hammers out of alignment.

e. Slide hammer and core out of place in hammer bank assembly.

f. Slide new hammer into position and tighten screws loosened in step d.

g. Cut leads for old hammer at P2. Red lead for this hammer is connected to P2 terminal having same number as column for which hammer was installed. Other lead is on pin immediately above it (18 numbers higher). The hammer leads can be cut off at each end where they enter the cable to P2, or they may be pulled from the cable.

h. Route leads for new hammer along cable to P2 and solder them to pins described in step g.

i. Replace mechanism in 5050B and print a trial tape. If hammer bank was removed, adjust for good printing as described in Paragraph 4-25h. Adjust new-print hammer for best printing; loosen screws loosened in step d, reposition hammer assembly as required and tighten screws. Make timing adjustment described in Paragraph 4-15.

4-28. Paper Advance Shaft

4-29. The soft bushing on the paper advance shaft will wear with use (especially if paper jams in mechanism and rubs against the shaft). Initially, this wear can be compensated for by adjustment of paper advance (see Paragraph 4-17). When paper advance assembly (adjustments become insufficient and paper cannot be advanced, paper advance shaft (HP Part No. 05050-4003) must be replaced. To replace paper advance shaft:

a. Turn off 5050B power and remove Mechanism Assembly from instrument.

b. Remove both drive belts from paper advance pulley (item L, Figure 7-10).

c. Remove paper advance pulley.

d. Remove retaining ring from right-hand end of paper advance shaft.

e. Pull paper advance shaft through one bearing, push end of shaft far enough to one side to push against inner bearing race. Tap outside end of shaft with plastic mallet to remove bearing.

f. Remove bearing and shaft.

g. Install new shaft. Retaining ring groove must be at right-hand side of shaft.

h. Press bearing in side casting. Take care to push only on outer flange.

i. Replace retaining ring.

j. Replace pulley. There should be no end play in shaft.

k. Replace drive belts.

l. Adjust paper advance assembly position (see Paragraph 4-17).

4-30. Paper Advance Assembly

4-31. The paper advance assembly (including the curved plastic paper guide) can be replaced as a unit. Order replacement by description; there is no HP Part Number for the assembly. To replace assembly:

a. Unsolder leads to terminal strip on paper advance assembly.

b. Remove two screws (items F, Figure 7-10) holding assembly to each side casting.

c. Push up from bottom on plastic paper guide, while lifting up on top of assembly. If necessary, spacing between side castings can be increased by loosening spacer at lower rear of mechanism and loosening paper advance shaft pulley.

d. Remove paper advance assembly by lifting it up and out of mechanism. It may be necessary to remove cable clamp at lower edge of right-hand side casting.

e. To install paper advance assembly, reverse procedure of steps a through d. Be sure to replace washer under hex head of eccentric bushing.

f. Adjust paper advance assembly position (see Paragraph 4-17).

4-32. Bearings

4-33. Paper advance shaft bearings.

a. Remove belt from paper advance shaft pulley.

b. Remove pulley (item L, Figure 7-10) or retaining ring (item N, Figure 7-10) on same side as bearing to be replaced.

c. Pull shaft back inside bearing to be replaced and push end of shaft to one side, enough so shaft pushes against inner bearing race. Tap outside end of shaft with plastic mallet to remove bearing.

d. Press new bearing in side casting, being careful to push only on outer flange.

e. Feed shaft out through bearing and replace pulley or retaining ring removed in step b.

f. Replace drive belts.

4-34. Print drum shaft bearings.

a. Remove drive belt from print drum shaft pulley.

b. Remove ink roll guard and ink roller.

c. Grasp print drum drive pulley with left hand. Remove screw (item A, Figure 7-10) holding code disc to print drum shaft. Remove code disc.

d. Loosen set screws holding pulley to print drum shaft. Remove pulley from shaft.

e. Remove screws (item B, Figure 7-10) holding optical encoder assembly to right-hand side casting. Remove optical encoder assembly.

f. Loosen 4 allen-drive set screws holding print drum to print drum shaft. Push print drum shaft out through right-hand side casting. To prevent damage to harp string, print drum must be kept centered by using a screwdriver or other spacer to keep it from moving toward right-hand casting as shaft is pushed out.

g. Remove print drum shaft and print drum from Mechanism Assembly.

h. Replace bearing(s).

i. Place print drum in position above harp string. Row of "1"s should be at top and row of "0"s should be toward front of mechanism (row of "A"s will be upside-down at front of mechanism).

j. Replace print drum shaft from right-hand side. Flat side of "D"-shaped key for code disc must be down (away from print drum "1" position). To prevent damage to harp string, use screwdriver or other spacer to keep print drum from moving toward left-hand side casting when replacing print drum shaft.

k. Replace pulley and tighten set screws holding it to shaft. Shaft should have little or no end play.

l. Spin print drum to see that it turns freely, without rubbing against paper guard (harp string). If necessary, move print drum on shaft to obtain free rotation.

m. Tighten 4 set screws holding print drum to shaft.

n. Replace optical encoder assembly.

o. Replace drive belt.

p. Replace inked roller, if used. Replace ink roller guard.

q. Make a test tape to check printout. If printing is not satisfactory, refer to timing adjustments, Paragraph 4-15.

4-35. Individual Print Wheels

4-36. For replacement standard print wheel, order HP Part No. 05050-6040. For replacement special print wheel, order by number listed on special insert sheet, or order by description, giving truth table for special wheel. Use following procedure when replacing one or more print wheels:

a. Remove print drum assembly, using procedure of Paragraph 4-34 a-g.

b. Clamp print drum shaft vertically in a vise and place print drum on shaft with end of drum closest to wheel to be replaced at top.

c. Remove two screws holding print drum end cap in place.

d. Remove print drum end cap, and spacer washer, if necessary.

e. If print drum wheels are black, proceed with step f. If print drum wheels are grey, use procedure accompanying replacement wheel. Note that where replacement wheels are adjacent in a grey print drum, washers are not required between them.

f. Beginning at top of print wheel stack, remove all print wheels through lowest one to be replaced.

g. Replace wheel or wheels as required. When replacing wheels, be sure characters are properly aligned with respect to wheels not removed (if all wheels are to be removed, note character positions around lower end cap).

h. Replace end cap (and spacer washer, if necessary).

i. Replace end cap screws.

j. Tighten print drum screws carefully, using procedure below to be sure assembly will not bind on print drum shaft.

- 1) Gently tighten screws and tap upper end of print drum with plastic hammer.
- 2) Remove shaft and print drum from vise and roll print drum along a level, soft, firm surface (such as a rubber mat) to be sure all wheels will be centered on print drum shaft. Be sure rows of characters are straight across print drum.
- 3) Tighten screws (two screws, each end).
- 4) Shaft should be loose enough to be pushed through print drum by hand. If necessary loosen end cap screws and move cap slightly to ease fit on shaft.

k. Replace print drum and print drum shaft in mechanism, using instructions of Paragraph 4-34 i-q.

4-37. Optical Encoder Assembly

4-38. LAMP REPLACEMENT

Note

The optical encoder assembly lamps are wired in series. If they are not lighted, and power supply voltages are ok, measure lamp resistances to determine which lamp is burned out. Also check for shorted leads, which may cause one lamp to be out while others are lighted.

a. Remove two screws (items M, Figure 7-10) holding lamp assembly to optical encoder assembly. Do not remove screws (item B, Figure 7-10) holding op-

tical encoder assembly mounting plate to assembly mounting plate to assembly side casting.

b. Remove lamp assembly. If assembly is to be replaced as a unit, proceed to step c. If an individual lamp is to be replaced, proceed to step d.

c. To replace lamp assembly, unsolder two wires to assembly from P1. Solder these wires to new assembly and replace assembly, reversing procedure of steps a and b.

d. To replace an individual lamp, unsolder that lamp. When installing new lamp, be sure leads are spread far enough apart to keep them from shorting when lamp is installed. Replace assembly, reversing procedure of steps a and b.

e. Print a test tape to determine if timing adjustments (see Paragraph 4-14) are required.

4-39. LASCR REPLACEMENT

a. Remove two screws (items M, Figure 7-10) holding lamp assembly to optical encoder assembly.

b. Remove lamp assembly.

c. Remove LASCR assembly from optical encoder mounting plate. Do not move encoder mounting plate.

d. Carefully unsolder and remove LASCR. One LASCR lead runs through a hole in the LASCR mounting block; be careful not to overheat block when removing LASCR or cleaning hole. (The LASCR mounting block cannot be removed without removing all LASCRs.)

e. Cut leads of new LASCR to slightly longer than length when installed. This minimizes lead bending required during installation. Install LASCR one lead at a time; try to avoid bending leads.

f. Solder new LASCR in place, being careful not to apply too much heat.

g. Replace LASCR assembly on optical encoder mounting plate.

h. Replace lamp assembly on LASCR assembly. Install screws removed in step a.

i. Make a test tape to determine if timing adjustments (see Paragraph 4-12) are required.

4-40. TROUBLESHOOTING

4-41. General

4-42. For checks of normal operating characteristics, see Table 4-3. If the 5050B fails some portion of checks, use troubleshooting hints below. Refer also to descriptions accompanying individual assembly schematics.

a. Check connections and switch settings.

- 1) Operating ac line
- 2) 115/230 switch setting.

- 3) Line fuse
- 4) Data sources and input cables to A1J1 and A1J2.
- 5) Print command select switch settings.
- 6) Print hammer wires connected either to column board assembly pins or terminal board assembly.

b. Paper installed correctly.

c. ON/OFF pushbutton depressed, LINE light lighted, LOAD PAPER light off, fan operating, print drum turning.

d. OPER pushbutton depressed.

e. Data source(s) should be inhibited during print cycle.

f. Printing should occur when required print commands are received (or when MAN PRINT pushbutton is pressed).

g. Printed output should agree with data input.

h. Numbers in printout should be in line, and evenly printed (not missing portions of characters, etc.).

i. Paper advances at end of print cycle.

4-43. Front-panel controls and indicator lights provide troubleshooting information and clues:

a. ON/OFF switch and LINE light. Switch controls power to fan motor, power supplies. LINE light, printer motor. All should operate when switch is depressed.

b. MAN SPACE acts through paper advance one-shot on A3 to advance paper one space each time it is pressed. This switch can be used to duplicate action occurring at end of print cycle.

c. MAN PRINT acts through print command flip-flops on A3 to begin print cycle. Duration of cycle is determined by timing signal counter on A4. Paper advances at end of cycle, data source(s) inhibited during cycle.

d. OPER enables normal printing operation (on command, determined by setting of switches on A3). Must be depressed to enable normal printing.

e. LOAD PAPER lamp lights when 5050B needs paper installed. Print cycle is interrupted and data source(s) inhibited while this light is on. Paper installation instructions are given in Section II.

4-44. Power Supply Voltages

4-45. Remove top cover for access to test points. Be careful, ac line voltage and high current -80V and -50V terminals are exposed.

a. -50V supply is adjusted by potentiometer on Power Supply Assembly A16. Voltage should be $-50V \pm 0.1V$ (requires meter more accurate than HP 412A). Regulation should be $\pm 0.25V$ for $\pm 10\%$ line voltage changes. Poor regulation can cause poor printouts, similar to timing mis-adjustments. If voltage on -50V (violet) leads is -80V, check Q12, Q13, and their drivers.

b. -24V supply should be -22.5 to -25.5V, no adjustment.

c. +24V supply should be +22.5 to +25.5V, no adjustment.

4-46. Mechanism Assembly.

4-47. Remove top cover for access to test points. Remove Mechanism Assembly. Install 05050-6024 Mechanism Extender (part of 05050-6023 Service Kit), extender has test points for code, timing, and reset waveforms. Sync oscilloscope (-EXT AC) to "D" test point. Observe waveforms (see Figure 7-8).

a. If no output from one or more code lines, check LASCR or lamp for bad lines.

b. If no reset, there will be no code output. Check A4.

c. If no timing pulse, there will be no code output, check A4 or LASCR and lamp. (Timing signal is required to produce reset signal.)

4-48. Additional Hints

a. If printer seems to be affecting data source(s), check A3 or A4. Troubles may include: no inhibit, continuous inhibit, etc.

b. If no output from only one column, check output fuse, SCR or biasing diodes (CR17 or CR20). Interchange Column Boards to determine if trouble is on board.

c. If no output from printer columns 1 through 9, check Q2 and Q5 (SCR turn-off transistors). If no output from printer columns 10 through 18, check Q3 and Q6 (SCR turn-off transistors). Check these transistors also, if Column Board Assembly fuse fail often.

d. If paper output free-runs, check A4.

e. If no MAN PRINT or MAN SPACE, check A3.

Figure 4-1. Troubleshooting Setup

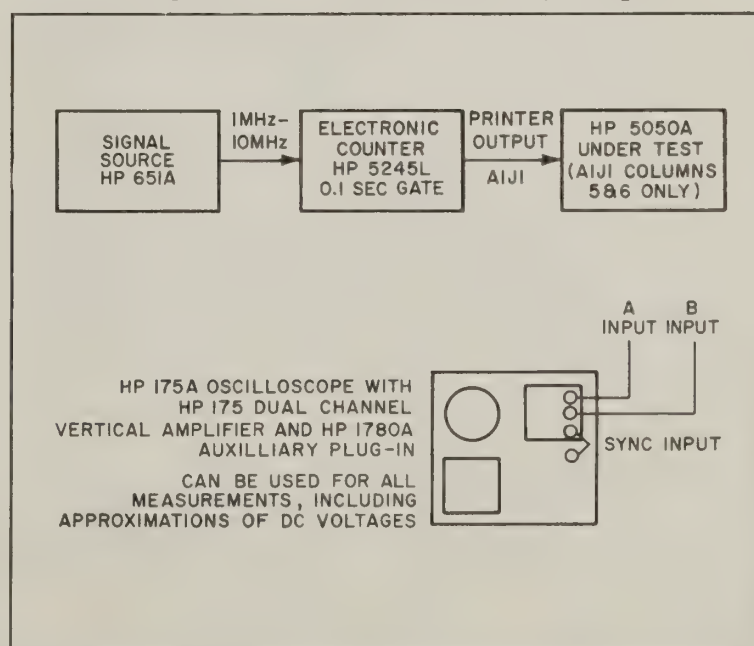


Table 4-3. In-Cabinet Performance Check

The procedures below check Model 5050B performance characteristics. This is not a check of specification limits. The performance checks can be used as a basis for troubleshooting the Model 5050B. The following performance characteristics are checked:

- A. Prints on command.
- B. Inhibits data source for sample rate compatibility.
- C. Printed output agrees with input data.
- D. Paper advances.
- E. Characters can be suppressed in printed output.

Perform setup procedures described in Section II to obtain desired printout format (column board setup, print hammer lead connection, print command selection switch settings, etc.).

Connect data source(s) to 5050B.

Connect 5050B to ac line.

Turn on 5050B and data source(s).

Set 5050B to OPER.

A. PRINTS ON COMMAND:

1. When one data source is connected: Vary cycling rate of data source (change GATE TIME, SAMPLE RATE, etc.). 5050B printout rate should change as data source cycle rate changes. Maximum printout rate is 20 lines/second (1 line /50 msec).

2. When two data sources are connected, printing cannot occur until 5050B has received a print command from each data source, so printout rate will follow slower of the two sources.

Vary cycling rates of data sources. 5050B printout rate should follow rate of slowest source. Maximum printout rate is 20 lines/second.

B. INHIBITS DATA SOURCE:

1. Set both print command select switches to their upper positions.

2. When a single data source is connected to the 5050B, it will cycle, generate a print command to the 5050B, and be inhibited until MAN PRINT pushbutton is pressed.

3. Press MAN PRINT pushbutton. 5050B will print, printout must agree with data input. At end of print cycle (50 msec after MAN PRINT button is pressed), inhibit to data source ends, and data source cycles again.

4. Perform above procedure with data source at each input connector.

C. PRINTED OUTPUT AGREES WITH DATA INPUT. (See also E, Character Suppression).

1. Note data input.

2. Compare printed output with data input.

D. PAPER ADVANCES AT CORRECT TIME.

Observe that each printed output is on only one line, and printed lines do not overlap.

E. CHARACTER SUPPRESSION.

1. Note character suppression system setup on Performance Check test Record. For each input column, indicate character to be suppressed and whether suppression defeat jumper is installed in its upper position (to allow suppression program to be defeated).

Table 4-3. In-Cabinet Performance Check (cont'd)

E. CHARACTER SUPPRESSION (cont'd)

2. Remove suppression defeat jumpers.
3. Feed, into each column, data for character to be suppressed. On print command, paper should advance without printing (except for those columns in which suppression is not programmed).
4. Replace jumpers as they were in step 1.
5. Feed, into lowest-numbered column of each data group, any number except the one programmed to be suppressed. Feed, into remaining columns of each data group, numbers to be suppressed. On print command, the only printed outputs should be from least significant column in each data group and from columns with no programmed suppression.
6. Repeat step 5, except feed number not to be suppressed to next higher column. All other columns in data group receive numbers to be suppressed. On print command, printed outputs should be from column not to be suppressed, all lower-numbered columns, and columns with no programmed suppression. Repeat until all columns have been checked.
7. Feed same data information (0000000000, 1111111111, 2222222222, etc.) to all columns and check that printout agrees (within limits imposed by suppression program).

Figure 4-2. Poor Printouts

Good Printout

All characters evenly printed

7 4 0 0 9 6 7 8 6 5 4 7 6 8

Poor Printouts

Tops of characters missing
(Printing occurring too late)
Advance timing (adjust coder,
Paragraph 4-14)

7 4 0 0 9 6 7 8 6 5 4 7 6 8

Bottoms of characters missing
(Printing occurring too early)
Retard timing (adjust encoder,
Paragraph 4-14)

7 4 0 0 9 6 7 8 6 5 4 7 6 8

Top of "8" missing (applies
to any character). Adjust print hammer,
Paragraph 4-25.

7 4 0 0 9 6 7 8 6 5 4 7 6 8

Bottom of "8" missing (applies to any
character); adjust print hammer,
Paragraph 4-25.

7 4 0 0 9 7 6 8 6 5 4 7 6 8

Ink buildup from print drum.
Adjust harp string, Paragraph 4-18.

7 4 0 0 7 8 5 3 6 8

PERFORMANCE CHECK TEST CARD

HP 5050B Digital Recorder

Tests performed by: _____

Serial No.: _____ - _____

Date: _____

Other I. D. Number: _____

A. PRINTS ON COMMAND

- | | | |
|---|--------------------|----------------------|
| 1. Single data source
Printout rate follows data source rate | 20 lines/sec. max. | <input type="text"/> |
| 2. Two data sources
Printout rate follows slower source | 20 lines/sec. max. | <input type="text"/> |

B. INHIBITS DATA SOURCE

- | | |
|----------------------------------|----------------------|
| 1. Data source connected to A1J1 | <input type="text"/> |
| 2. Data source connected to A1J2 | <input type="text"/> |

C. PRINTED OUTPUT AGREES WITH DATA INPUT

Data input	Input	<input type="text"/>
Printed output	Output	<input type="text"/>

D. PAPER ADVANCES AT CORRECT TIME

Printing on one line, lines do not overlap	One line	<input type="text"/>
	No overlap	<input type="text"/>

E. CHARACTER SUPPRESSION

- | | | |
|--|----------------------|----------------------|
| 1. Suppression system step | | <input type="text"/> |
| Column No. | | |
| Number to be suppressed | | |
| Jumper in upper position | | |
| (No effect in Col. 10) | | |
| 3. No suppressed numbers print,
paper advances | | |
| 5. Suppression defeat: lowest-numbered
columns in each data group have
printout | No. to be suppressed | <input type="text"/> |
| | Input | <input type="text"/> |
| | Printout | <input type="text"/> |
| 6. Suppression defeat: repeat step 5 for
higher-numbered columns in each
data group. | Printouts correct | <input type="text"/> |

PERFORMANCE CHECK TEST CARD (cont'd)

E. CHARACTER SUPPRESSION (Continued)

7. Same data, all columns:

INPUT

OUTPUT

all "0"

all "1"

all "3"

all "4"

all "5"

all "6"

all "7"

all "8"

all "9"

all "+"

all "-"

all "V"

all "A"

all "Ω"

all "*"

SECTION V

REPLACEABLE PARTS

5-1. INTRODUCTION

5-2. Table 5-1 lists parts for standard, Option 50, and Option 51 5050B's in order of reference designator. Table 5-2 (with exceptions noted below) lists same parts by HP Part No., giving total quantity (TQ) of each part in each instrument. Exceptions to Table 5-2 listing are: 1) TQ of Mechanism Assembly (A15) mechanical parts (beginning with A15MP4) is given in Table 5-1; and 2) TQ for Column Board Assembly (A5-A14) is given in Table 5-3. Mechanism Assembly parts are shown in Figure 5-1.

5-3. Parts descriptions in Tables 5-2 and 5-3 include:

- a. Description of part (see abbreviations below).
- b. Typical manufacturer of the part, using a 5-digit code (see code list of manufacturers, Table 5-4).
- c. Manufacturer's part number for the part.

d. Total quantity (TQ) of part used in instrument. For Column Board Assemblies, multiply TQ given in Table 5-3 by number of boards in instrument and add to quantities in Table 5-2.

5-4. ORDERING INFORMATION

5-5. Address replacement parts order or inquiry to nearest Hewlett-Packard sales and service office listed at back of this manual. Be sure to identify parts by their Hewlett-Packard Part Numbers.

5-6. To obtain a part not listed, include:

- a. Instrument model number (or Option or specification number).
- b. Complete instrument serial number.
- c. Description of part, including function and location.

REFERENCE DESIGNATORS

A = assembly	F = fuse	MP = mechanical part	V = vacuum, tube, neon bulb, photocell, etc.
B = motor	FL = filter	P = plug	VR = voltage regulator
BT = battery	IC = integrated circuit	Q = transistor	W = cable
C = capacitor	J = jack	R = resistor	X = socket
CP = coupler	K = relay	RT = thermistor	Y = crystal
CR = diode	L = inductor	S = switch	Z = tuned cavity, network
DL = delay line	LS = loud speaker	T = transformer	
DS = device signaling (lamp)	M = meter	TB = terminal board	
E = misc electronic part	MK = microphone	TP = test point	

ABBREVIATIONS

A = amperes	H = henries	N/O = normally open	RMO = rack mount only
AFC = automatic frequency control	HDW = hardware	NPO = negative positive zero (zero temperature coefficient)	RMS = root-mean square
AMPL = amplifier	HEX = hexagonal	NPN = negative-positive-negative	RWV = reverse working voltage
BFO = beat frequency oscillator	HG = mercury	NRFR = not recommended for field replacement	S-B = slow-blow
BE CU = beryllium copper	HR = hour(s)	NSR = not separately replaceable	SCR = screw
BH = binder head	HZ = hertz	OBD = order by description	SE = selenium
BP = bandpass	IF = intermediate freq	OH = oval head	SECT = section(s)
BRS = brass	IMPG = impregnated	OX = oxide	SEMICON = semiconductor
BWO = backward wave oscillator	INCD = incandescent	P = peak	SI = silicon
CCW = counter-clockwise	INCL = include(s)	PC = printed circuit	SIL = silver
CER = ceramic	INS = insulation(ed)	PF = picofarads = 10^{-12} farads	SL = slide
CMO = cabinet mount only	INT = internal	PH BRZ = phosphor bronze	SPG = spring
COEF = coefficient	K = kilo = 1000	PHL = Phillips	SPL = special
COM = common	LH = left hand	PIV = peak inverse voltage	SST = stainless steel
COMP = composition	LN = linear taper	PNP = positive-negative-positive	SR = split ring
COMPL = complete	LK WASH = lock washer	P/O = part of	STL = steel
CONN = connector	LOG = logarithmic taper	POLY = polystyrene	TA = tantalum
CP = cadmium plate	LPF = low pass filter	PORC = porcelain	TD = time delay
CRT = cathode-ray tube	M = milli = 10^{-3}	POS = position(s)	TGL = toggle
CW = clockwise	MEG = meg = 10^6	POT = potentiometer	THD = thread
DEPC = deposited carbon	MET FLM = metal film	PP = peak-to-peak	TI = titanium
DR = drive	MET OX = metallic oxide	PT = point	TOL = tolerance
ELECT = electrolytic	MFR = manufacturer	PWV = peak working voltage	TRIM = trimmer
ENCAP = encapsulated	MHZ = mega hertz	RECT = rectifier	TWT = traveling wave tube
EXT = external	MINAT = miniature	RF = radio frequency	U = micro = 10^{-6}
F = farads	MOM = momentary	RH = round head or right hand	VAR = variable
FH = flat head	MTG = mounting		VDCW = dc working volts
FIL H = fillister head	MY = "mylar"		W/ = with
FXD = fixed	N = nano (10^{-9})		W = watts
G = giga (10^9)	N/C = normally closed		WIV = working inverse voltage
GE = germanium	NE = neon		WW = wirewound
GL = glass	NI PL = nickel plate		W/O = without
GRD = ground(ed)			

01194-13

Table 5-1. Reference Designation Index

Reference Designation	Part No.	Description #	Note
A1J1	05050-6018	BOARD ASSY:INPUT(STANDARD)	
	05050-2060	BOARD:BLANK PC	
A1J1C1	0160-0168	C:FXD MY 0.1 UF 10% 200VDCW	
A1J1C2	0160-0168	C:FXD MY 0.1 UF 10% 200VDCW	
A1J1CR1	1902-0048	DIODE BREAKDOWN:6.81V 5%	
A1J1J1	1251-0087	CONNECTOR:FEMALE 50-PIN MINAT	
A1J1R1	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A1J1R2	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A1J2	05050-6019	BOARD ASSY:INPUT(STANDARD)	
	05050-2061	BOARD:BLANK PC	
A1J2C3	0160-0168	C:FXD MY 0.1 UF 10% 200VDCW	
A1J2C4	0160-0168	C:FXD MY 0.1 UF 10% 200VDCW	
A1J2CR2	1902-0048	DIODE BREAKDOWN:6.81V 5%	
A1J2J2	1251-0087	CONNECTOR:FEMALE 50-PIN MINAT	
A1J2R3	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A1J2R4	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A1J1	05050-6020	BOARD ASSY:INPUT STORAGE(OPTION 50 OR 51)	
	05050-2062	BOARD:BLANK PC	
A1J1C1	0160-0168	C:FXD MY 0.1 UF 10% 200VDCW	
A1J1C2	0180-0229	C:FXD ELECT 33 UF 10% 10VDCW	
A1J1C3	0180-2150	C:FXD ELECT 1300 UF +75-10% 15VDCW	
A1J1CR1	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR2	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR3	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR4	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR5	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR6	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR7	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR8	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR9	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR10	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR11	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR12	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR13	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR14	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR15	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR16	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR17	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR18	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR19	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR20	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR21	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR22	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR23	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR24	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR25	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR26	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR27	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR28	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR29	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR30	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR31	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR32	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR33	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR34	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR35	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR36	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR37	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR38	1901-0081	DIODE:SILICON 50 VOLTS WORKING	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A1J1(OPTION 50 OR 51, CONTINUED)	
A1J1CR39	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR40	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J1CR41	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A1J1CR42	1902-3357	DIODE:BREAKDOWN:56.2V 5%	
A1J1CR43	1902-0041	DIODE:BREAKDOWN:5.11V 5% 400MW	
A1J1CR44	1902-0783	DIODE BREAKDOWN:16.2V 5%	
A1J1CR45	1901-0049	DIODE:SILICON 50PIV	
A1J1CR46	1901-0049	DIODE:SILICON 50PIV	
A1J1CR47	1901-0049	DIODE:SILICON 50PIV	
A1J1CR48	1901-0049	DIODE:SILICON 50PIV	
A1J1CR49	1902-0049	DIODE,BREAKDOWN: 6.19V 5%	
A1J1IC1	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J1IC2	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J1IC3	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J1IC4	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J1IC5	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J1IC6	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J1IC7	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J1IC8	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J1IC9	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J1IC10	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J1J1	1251-0087	CONNECTOR:FEMALE 50-PIN MINAT	
A1J1P1	1251-0475	CONNECTOR:PC 6 CONTACT	
A1J1Q1	1854-0087	TRANSISTOR:NPN SILICON 2N3417	
A1J1Q2	1854-0022	TRANSISTOR:NPN SILICON	
A1J1Q3	1854-0022	TRANSISTOR:NPN SILICON	
A1J1Q4	1854-0300	TRANSISTOR:SILICON NPN	
A1J1Q5	1854-0071	TRANSISTOR:SILICON NPN	
A1J1R1	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R2	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R3	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R4	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R5	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R6	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R7	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R8	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R9	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R10	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R11	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R12	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R13	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R14	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R15	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R16	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R17	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A1J1(OPTION 50 OR 51, CONTINUED)			
A1J1R18	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R19	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R20	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R21	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R22	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R23	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R24	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R25	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R26	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R27	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R28	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R29	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R30	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R31	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R32	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R33	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R34	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R35	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R36	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R37	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R38	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R39	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R40	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J1R41	2100-1777	R:VAR WW 20K OHM 10% LIN 1/2W	
A1J1R42	0758-0005	R:FXD MET OX 4700 OHM 5% 1/2W	
A1J1R43	0698-3443	R:FXD MET FLM 287 OHM 1% 1/8W	
A1J1R44	0758-0023	R:FXD MET OX 240 OHM 5% 1/2W	
A1J1R45	0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	
A1J1R46	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
MISC.	562A-76D	HOOD:CONNECTOR	
A1J2	05050-6021	BOARD ASSY:INPUT STORAGE(OPTION 50 ONLY)	
	05050-2063	BOARD:BLANK PC	
A1J2C1	0160-0168	C:FXD MY 0.1 UF 10% 200VDCW	
A1J2C2	0180-0229	C:FXD ELECT 33 UF 10% 10VDCW	
A1J2C3	0180-2150	C:FXD ELECT 1300 UF +75-10% 15VDCW	
A1J2CR1	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR2	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR3	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR4	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR5	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR6	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR7	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR8	1901-0081	DIODE:SILICON 50 VOLTS WORKING	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A1J2(OPTION 50 ONLY, CONTINUED)			
A1J2CR9	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR10	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR11	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR12	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR13	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR14	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR15	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR16	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR17	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR18	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR19	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR20	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR21	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR22	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR23	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR24	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR25	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR26	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR27	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR28	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR29	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR30	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR31	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR32	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR33	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR34	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR35	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR36	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR37	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR38	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR39	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR40	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A1J2CR41	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A1J2CR42	1902-3357	DIODE BREAKDOWN:56.2V 5%	
A1J2CR43	1902-0041	DIODE:BREAKDOWN 5.11V 5% 400MW	
A1J2CR44	1902-0783	DIODE:BREAKDOWN 16.2V 5%	
A1J2CR45	1901-0049	DIODE:SILICON 50PIV	
A1J2CR46	1901-0049	DIODE:SILICON 50PIV	
A1J2CR47	1901-0049	DIODE:SILICON 50PIV	
A1J2CR48	1901-0049	DIODE:SILICON 50PIV	
A1J2CR49	1902-0049	DIODE,BREAKDOWN: 6.19V 5%	
A1J2IC1	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J2IC2	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J2IC3	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J2IC4	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J2IC5	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A1J2(OPTION 50 ONLY, CONTINUED)			
A1J2IC6	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J2IC7	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J2IC8	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J2IC9	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J2IC10	1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	
A1J2J2	1251-0087	CONNECTOR:FEMALE 50-PIN MINAT	
A1J2P2	1251-0475	CONNECTOR:PC 6 CONTACT	
A1J2Q1	1854-0087	TRANSISTOR:NPN SILICON 2N3417	
A1J2Q2	1854-0022	TRANSISTOR:NPN SILICON	
A1J2Q3	1854-0022	TRANSISTOR:NPN SILICON	
A1J2Q4	1854-0300	TRANSISTOR:SILICON NPN	
A1J2Q5	1854-0071	TRANSISTOR:SILICON NPN	
A1J2R1	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R2	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R3	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R4	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R5	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R6	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R7	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R8	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R9	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R10	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R11	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R12	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R13	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R14	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R15	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R16	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R17	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R18	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R19	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R20	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R21	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R22	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R23	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R24	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R25	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R26	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R27	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R28	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R29	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R30	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R31	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R32	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A1J2(OPTION 50 ONLY, CONTINUED)	
A1J2R33	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R34	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R35	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R36	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R37	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R38	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R39	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R40	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A1J2R41	2100-1777	R:VAR WW 20K OHM 10% LIN 1/2W	
A1J2R42	0758-0005	R:FXD MET OX 4700 OHM 5% 1/2W	
A1J2R43	0698-3443	R:FXD MET FLM 287 OHM 1% 1/8W	
A1J2R44	0758-0023	R:FXD MET OX 240 OHM 5% 1/2W	
A1J2R45	0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	
A1J2R46	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
MISC.	562A-76P	HOOD:CONNECTOR	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A2	05050-6001	BOARD ASSY:MASTER	
	05050-2001	BOARD:BLANK PC	
A2J1	1251-1370	CONNECTOR:PC 50 CONTACT	
A2J2	1251-1370	CONNECTOR:PC 50 CONTACT	
A2XA3	1251-0498	CONNECTOR:PC 22 CONTACTS	
A2XA4	1251-0498	CONNECTOR:PC 22 CONTACTS	
A2XA5	1251-0498	CONNECTOR:PC 22 CONTACTS	
A2XA6	1251-0498	CONNECTOR:PC 22 CONTACTS	
A2XA7	1251-0498	CONNECTOR:PC 22 CONTACTS	
A2XA8	1251-0498	CONNECTOR:PC 22 CONTACTS	
A2XA9	1251-0498	CONNECTOR:PC 22 CONTACTS	
A2XA10	1251-0498	CONNECTOR:PC 22 CONTACTS	
A2XA11	1251-0498	CONNECTOR:PC 22 CONTACTS	
A2XA12	1251-0498	CONNECTOR:PC 22 CONTACTS	
A2XA13	1251-0498	CONNECTOR:PC 22 CONTACTS	
A2XA14	1251-0498	CONNECTOR:PC 22 CONTACTS	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A3	05050-6005	BOARD ASSY:PRINT COMMAND(STANDARD)	
	05050-2005	BOARD:BLANK PC	
A3C1	0150-0069	C:FXD CER 1000 PF +100-20% 500VDCW	
A3C2	0160-0161	C:FXD MY 0.01 UF 10% 200VDCW	
A3C3	0160-0161	C:FXD MY 0.01 UF 10% 200VDCW	
A3C4	0160-0161	C:FXD MY 0.01 UF 10% 200VDCW	
A3C5	0160-0161	C:FXD MY 0.01 UF 10% 200VDCW	
A3C6	THRU	NOT ASSIGNED	
A3C9		NOT ASSIGNED	
A3C10	0160-0154	C:FXD MYLAR 2200PF 10%	
A3C11	0180-1773	C:FXD ELECT 0.68 UF 5% 35VDCW	
A3C12	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A3C13	0180-0159	C:FXD ELECT 220 UF 10% 10VDCW	
A3C14	0160-0157	C:FXD MY 0.0047 UF 10% 200VDCW	
A3C15	0160-0157	C:FXD MY 0.0047 UF 10% 200VDCW	
A3CR1	1902-0025	DIODE,BREAKDCWN:10.0V 5% 400 MW	
A3CR2	1902-0025	DIODE,BREAKDOWN:10.0V 5% 400 MW	
A3CR3	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR4	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR5	1902-3139	DIODE BREAKDOWN:SILICON 8.25V 5%	
A3CR6	1902-3139	DIODE BREAKDOWN:SILICON 8.25V 5%	
A3CR7	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR8	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR9	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR10	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR11	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR12	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR13	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR14	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR15	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR16	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR17	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR18	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR19	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR20	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR21	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR22	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR23	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3CR24	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A3Q1	1854-0071	TRANSISTOR:SILICON NPN	
A3Q2	1854-0071	TRANSISTOR:SILICON NPN	
A3Q3	1853-0020	TRANSISTOR:SILICON PNP	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A3(STANDARD, CONTINUED)			
A3Q4	1853-0020	TRANSISTOR:SILICON PNP	
A3Q5	1853-0020	TRANSISTOR:SILICON PNP	
A3Q6	1854-0071	TRANSISTOR:SILICON NPN	
A3Q7	1854-0071	TRANSISTOR:SILICON NPN	
A3Q8	1853-0073	TRANSISTOR	
A3Q9	1853-0020	TRANSISTOR:SILICON PNP	
A3Q10	1854-0071	TRANSISTOR:SILICON NPN	
A3R1	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A3R2	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A3R3	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A3R4	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A3R5	0684-1051	R:FXD COMP 1MEGOHM 1% 1/4W	
A3R6	0684-1051	R:FXD COMP 1MEGOHM 1% 1/4W	
A3R7	0683-3335	R:FXD COMP 33K OHM 5% 1/4W	
A3R8	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A3R9	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A3R10	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A3R11	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A3R12	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R13	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R14	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A3R15	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A3R16	0683-3335	R:FXD COMP 33K OHM 5% 1/4W	
A3R17	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A3R18	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A3R19	0683-3335	R:FXD COMP 33K OHM 5% 1/4W	
A3R20	0684-4701	R:FXD COMP 47 OHM 10% 1/4W	
A3R21	0684-4701	R:FXD COMP 47 OHM 10% 1/4W	
A3R22	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A3R23	0683-1335	R:FXD COMP 13K OHM 5% 1/4W	
A3R24	0683-2435	R:FXD COMP 24K OHM 5% 1/4W	
A3R25	0683-1335	R:FXD COMP 13K OHM 5% 1/4W	
A3R26	0683-1335	R:FXD COMP 13K OHM 5% 1/4W	
A3R27	0683-2435	R:FXD COMP 24K OHM 5% 1/4W	
A3R28	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R29	0683-1335	R:FXD COMP 13K OHM 5% 1/4W	
A3R30	0683-2435	R:FXD COMP 24K OHM 5% 1/4W	
A3R31	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A3R32	0684-4701	R:FXD COMP 47 OHM 10% 1/4W	
A3R33	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R34	0684-4701	R:FXD COMP 47 OHM 10% 1/4W	
A3R35	0683-2435	R:FXD COMP 24K OHM 5% 1/4W	
A3R36	0683-3335	R:FXD COMP 33K OHM 5% 1/4W	
A3R37	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A3R38	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A3R39	0683-3335	R:FXD COMP 33K OHM 5% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A3(STANDARD, CONTINUED)	
A3R40	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A3R41	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A3R42	0684-8231	R:FXD COMP 82K OHM 10% 1/4W	
A3R43	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A3R44	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A3R45	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A3R46	0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	
A3R47	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A3R48	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A3R49	0758-0070	R:FXD MET OX 1200 OHM 5% 1/2W	
A3R50	0684-2721	R:FXD COMP 2700 OHM 10% 1/4W	
A3R51	0684-1221	R:FXD COMP 1.2K OHM 10% 1/4W	
A3R52	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A3R53	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A3R54	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R55	0684-2721	R:FXD COMP 2700 OHM 10% 1/4W	
A3R56	0683-3035	R:FXD COMP 30K OHM 5% 1/4W	
A3R57	0761-0026	R:FXD MET OX 220 OHM 5% 1W	
A3R58	0684-3911	R:FXD COMP 390 OHM 10% 1/4W	
A3R59	0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	
A3R60	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A3R61	0698-3688	R:FXD MET OX 18 OHM 5% 1W	
A3R62	0684-1061	R:FXD COMP 10 MEGOHM 10% 1/4W	
A3R63	0683-2435	R:FXD COMP 24K OHM 5% 1/4W	
A3R64	0683-2435	R:FXD COMP 24K OHM 5% 1/4W	
A3R65	0683-1335	R:FXD COMP 13K OHM 5% 1/4W	
A3R66	0683-1335	R:FXD COMP 13K OHM 5% 1/4W	
A3R67	0683-2435	R:FXD COMP 24K OHM 5% 1/4W	
A3R68	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A3R69	0683-2435	R:FXD COMP 24K OHM 5% 1/4W	
A3R70	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A3S1	3101-0932	SWITCH:SLIDE DPDT	
A3S2	3101-0932	SWITCH:SLIDE DPDT	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A3	05050-6017	BOARD ASSY:STORAGE PRINT COMMAND(OPTION 50 OR 51)	
	05050-2059	BOARD:BLANK PC	
A3C1	0160-2188	C:FXD MY 3900 PF 5%	
A3C2	0160-2188	C:FXD MY 3900 PF 5%	
A3C3	0160-2188	C:FXD MY 3900 PF 5%	
A3C4	0160-2188	C:FXD MY 3900 PF 5%	
A3C5	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A3C6	0160-0299	C:FXD MY 1800 PF 10% 200VDCW	
A3C7	0160-0299	C:FXD MY 1800 PF 10% 200VDCW	
A3C8	0160-0362	C:FXD MICA 510PF 5%	
A3C9	0160-0362	C:FXD MICA 510PF 5%	
A3C10	0160-2208	C:FXD MICA 330 PF 5% 300VDCW	
A3C11	0160-0362	C:FXD MICA 510PF 5%	
A3C12	0160-0362	C:FXD MICA 510PF 5%	
A3C13	0160-0299	C:FXD MY 1800 PF 10% 200VDCW	
A3C14	0160-0299	C:FXD MY 1800 PF 10% 200VDCW	
A3C15	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A3C16	0160-2188	C:FXD MY 3900 PF 5%	
A3C17	0160-2188	C:FXD MY 3900 PF 5%	
A3C18	0160-0362	C:FXD MICA 510PF 5%	
A3C19	0160-0153	C:FXD MY 1000 PF 10% 200VDCW	
A3C20	0160-0362	C:FXD MICA 510PF 5%	
A3C21	0180-1773	C:FXD ELECT 0.68 UF 5% 35VDCW	
A3C22	0140-0196	C:FXD MICA 150 PF 5%	
A3C23	0140-0196	C:FXD MICA 150 PF 5%	
A3C24	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A3C25	0180-0159	C:FXD ELECT 220 UF 10% 10VDCW	
A3C26	0160-2208	C:FXD MICA 330 PF 5% 300VDCW	
A3CR1	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A3CR2	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A3CR3	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A3CR4	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A3CR5	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A3CR6	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A3CR7	1902-0057	DIODE BREAKDOWN:6.49V	
A3CR8	1902-3139	DIODE BREAKDOWN:SILICON 8.25V 5%	
A3CR9	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A3CR10	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR11	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A3CR12	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR13	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR14	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR15	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A3CR16	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A3(OPTION 50 OR 51, CONTINUED)	
A3CR17	1902-3139	DIODE BREAKDOWN:SILICON 8.25V 5%	
A3CR18	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR19	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR20	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR21	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR22	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR23	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR24	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR25	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR26	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR27	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR28	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR29	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR30	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR31	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR32	1902-3139	DIODE BREAKDOWN:SILICON 8.25V 5%	
A3CR33	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR34	1902-3139	DIODE BREAKDOWN:SILICON 8.25V 5%	
A3CR35	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR36	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR37	1901-0040	DIODE:SILICON 30MA 30WV	
A3CR38	1901-0040	DIODE:SILICON 30MA 30WV	
A3Q1	1854-0071	TRANSISTOR:SILICON NPN	
A3Q2	1854-0071	TRANSISTOR:SILICON NPN	
A3Q3	1853-0036	TRANSISTOR:SILICON PNP	
A3Q4	1853-0036	TRANSISTOR:SILICON PNP	
A3Q5	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A3Q6	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A3Q7	1853-0020	TRANSISTOR:SILICON PNP	
A3Q8	1853-0020	TRANSISTOR:SILICON PNP	
A3Q9	1853-0036	TRANSISTOR:SILICON PNP	
A3Q10	1853-0036	TRANSISTOR:SILICON PNP	
A3Q11	1854-0071	TRANSISTOR:SILICON NPN	
A3Q12	1854-0071	TRANSISTOR:SILICON NPN	
A3Q13	1854-0071	TRANSISTOR:SILICON NPN	
A3Q14	1854-0071	TRANSISTOR:SILICON NPN	
A3Q15	1854-0071	TRANSISTOR:SILICON NPN	
A3Q16	1854-0071	TRANSISTOR:SILICON NPN	
A3Q17	1853-0036	TRANSISTOR:SILICON PNP	
A3Q18	1854-0071	TRANSISTOR:SILICON NPN	
A3Q19	1854-0071	TRANSISTOR:SILICON NPN	
A3Q20	1853-0073	TRANSISTOR	
A3R1	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A3R2	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A3R3	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A3(OPTION 50 OR 51, CONTINUED)			
A3R4	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R5	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R6	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R7	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R8	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R9	0683-3625	R:FXD COMP 3600 OHM 5% 1/4W	
A3R10	0683-3625	R:FXD COMP 3600 OHM 5% 1/4W	
A3R11	0683-3935	R:FXD COMP 39K OHM 5% 1/4W	
A3R12	0683-3935	R:FXD COMP 39K OHM 5% 1/4W	
A3R13	0683-6225	R:FXD COMP 6200 OHM 5% 1/4W	
A3R14	0683-6225	R:FXD COMP 6200 OHM 5% 1/4W	
A3R15	0683-6225	R:FXD COMP 6200 OHM 5% 1/4W	
A3R16	0683-5625	R:FXD COMP 5600 OHM 5% 1/4W	
A3R17	0683-6225	R:FXD COMP 6200 OHM 5% 1/4W	
A3R18	0683-3935	R:FXD COMP 39K OHM 5% 1/4W	
A3R19	0683-3935	R:FXD COMP 39K OHM 5% 1/4W	
A3R20	0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	
A3R21	0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	
A3R22	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A3R23	0683-3625	R:FXD COMP 3600 OHM 5% 1/4W	
A3R24	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R25	0683-3625	R:FXD COMP 3600 OHM 5% 1/4W	
A3R26	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R27	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A3R28	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R29	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R30	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R31	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R32	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A3R33	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A3R34	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A3R35	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A3R36	0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	
A3R37	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A3R38	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A3R39	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A3R40	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A3R41	0757-0954	R:FXD MET FLM 18K OHM 2% 1/4W	
A3R42	0757-0954	R:FXD MET FLM 18K OHM 2% 1/4W	
A3R43	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A3R44	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A3R45	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A3R46	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A3R47	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R48	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R49	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R50	0683-3935	R:FXD COMP 39K OHM 5% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A3(OPTION 50 OR 51, CONTINUED)			
A3R51	0683-3935	R:FXD COMP 39K OHM 5% 1/4W	
A3R52	0683-3935	R:FXD COMP 39K OHM 5% 1/4W	
A3R53	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R54	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A3R55	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R56	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A3R57	0683-3935	R:FXD COMP 39K OHM 5% 1/4W	
A3R58	0683-5625	R:FXD COMP 5600 OHM 5% 1/4W	
A3R59	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A3R60	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A3R61	0683-5625	R:FXD COMP 5600 OHM 5% 1/4W	
A3R62	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A3R63	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A3R64	0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	
A3R65	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A3R66	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A3R67	0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	
A3R68	0683-1535	R:FXD COMP 15K OHM 5% 1/4W	
A3R69	0683-3035	R:FXD COMP 30K OHM 5% 1/4W	
A3R70	0683-3035	R:FXD COMP 30K OHM 5% 1/4W	
A3R71		NOT INSTALLED	
A3R72		NOT INSTALLED	
A3R73	0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	
A3R74	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R75	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A3R76	0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	
A3R77	0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	
A3R78	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R79	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R80	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R81	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A3R82	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A3R83	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A3R84	0683-3035	R:FXD COMP 30K OHM 5% 1/4W	
A3R85	0758-0028	R:FXD MET OX 270 OHM 5% 1/2W	
A3R86	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A3R87	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A3R88	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A3R89	0683-3335	R:FXD COMP 33K OHM 5% 1/4W	
A3R90		NOT INSTALLED	
A3R91		NOT INSTALLED	
A3R92	0683-2035	R:FXD COMP 20K OHM 5% 1/4W	
A3R93	0698-3688	R:FXD MET OX 18 OHM 5% 1W	
A3R94	0683-1065	R:FXD COMP 10M OHM 5% 1/4W	
A3S1	3101-0932	SWITCH:SLIDE DPDT	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A4	05050-6004	BOARD ASSY:TIMING	
	05050-2004	BOARD:BLANK PC	
A4C1	0180-0291	C:FXD ELECT 1UF 10% 35VDCW	
A4C2	0170-0019	C:FXD MY 0.1 UF 5% 200VDCW	
A4C3	0160-0157	C:FXD MY 0.0047 UF 10% 200VDCW	
A4C4	0160-0157	C:FXD MY 0.0047 UF 10% 200VDCW	
A4C5	0140-0149	C:FXD MICA 47 UUF 5%	
A4C6	0180-0117	C:FXD ELECT TA 2.7UF 10% 35VDCW	
A4C7		NOT ASSIGNED	
A4C8	0150-0069	C:FXD CER 1000 PF +100-20% 500VDCW	
A4C9	0140-0149	C:FXD MICA 47 UUF 5%	
A4C10	0180-1773	C:FXD ELECT 0.68 UF 5% 35VDCW	
A4C11	0140-0196	C:FXD MICA 150 PF 5%	
A4C12	0140-0149	C:FXD MICA 47 UUF 5%	
A4C13	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A4C14	0140-0149	C:FXD MICA 47 UUF 5%	
A4C15	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A4C16	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A4C17	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A4C18	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A4C19	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A4C20	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A4C21	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A4C22	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A4C23	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A4C24	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A4C25	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A4C26	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A4C27	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A4C28	0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	
A4C29	0180-0376	C:FXD ELECT 0.47 UF 10% 35VDCW	
A4C30	0180-0291	C:FXD ELECT 1 UF 10% 35VDCW	
A4C31	0180-1746	C:FXD ELECT 15 UF 10% 20VDCW	
A4CR1 THRU	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR3	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR4		DELETED	
A4CR5	1902-0055	DIODE BREAKDOWN:14.7V 10%	
A4CR6	1902-0022	DIODE BREAKDOWN:2.67V	
A4CR7	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A4CR8	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR9	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR10	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR11	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR12	1901-0081	DIODE:SILICON 50 VOLTS WORKING	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A4(CONTINUED)	
A4CR13	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR14	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR15	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR16	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR17	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR18	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR19	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR20	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR21	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR22	1902-3079	DIODE BREAKDOWN:SILICON 4.53V	
A4CR23	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR24	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A4CR25	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR26	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR27	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A4CR28	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR29	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR30	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A4CR31	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR32	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR33	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A4CR34 THRU	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR36	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A4CR37	1902-0017	DIODE BREAKDOWN:6.81V 10% 400MW	
A4Q1	1853-0020	TRANSISTOR:SILICON PNP	
A4Q2	1853-0020	TRANSISTOR:SILICON PNP	
A4Q3	1853-0020	TRANSISTOR:SILICON PNP	
A4Q4	1853-0020	TRANSISTOR:SILICON PNP	
A4Q5	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A4Q6	1853-0020	TRANSISTOR:SILICON PNP	
A4Q7	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A4Q8	1853-0020	TRANSISTOR:SILICON PNP	
A4Q9	1853-0016	TRANSISTOR:SILICON PNP 2N3638	
A4Q10	1853-0020	TRANSISTOR:SILICON PNP	
A4Q11	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A4Q12	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A4Q13	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A4Q14	1854-0071	TRANSISTOR:SILICON NPN	
A4Q15	1853-0020	TRANSISTOR:SILICON PNP	
A4Q16	1853-0020	TRANSISTOR:SILICON PNP	
A4Q17	1853-0020	TRANSISTOR:SILICON PNP	
A4Q18	1853-0020	TRANSISTOR:SILICON PNP	
A4Q19	1853-0020	TRANSISTOR:SILICON PNP	
A4Q20	1853-0020	TRANSISTOR:SILICON PNP	
A4Q21	1853-0020	TRANSISTOR:SILICON PNP	
A4Q22	1853-0020	TRANSISTOR:SILICON PNP	
A4Q23	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A4R1	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A4(CONTINUED)	
A4R2	0683-3335	R:FXD COMP 33K OHM 5% 1/4W	
A4R3	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R4	0683-1235	R:FXD COMP 12K OHM 5% 1/4W	
A4R5	0684-3911	R:FXD COMP 390 OHM 10% 1/4W	
A4R6	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A4R7	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R8	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A4R9	0684-2221	R:FXD COMP 2200 OHM 10% 1/4W	
A4R10	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A4R11	0684-2221	R:FXD COMP 2200 OHM 10% 1/4W	
A4R12	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A4R13	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R14	0684-3921	R:FXD COMP 3900 OHM 10% 1/4W	
A4R15	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A4R16	0684-8221	R:FXD COMP 8200 OHM 10% 1/4W	
A4R17	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R18	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A4R19	0684-6821	R:FXD COMP 6.8K OHM 10% 1/4W	
A4R20	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R21	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R22	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R23	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R24		DELETED	
A4R25	0684-3921	R:FXD COMP 3900 OHM 10% 1/4W	
A4R26	0684-4731	R:FXD COMP 47K OHM 10% 1/4W	
A4R27	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R28	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R29	0683-9115	R:FXD COMP 910 OHM 5% 1/4W	
A4R30	0683-1335	R:FXD COMP 13K OHM 5% 1/4W	
A4R31	0684-2221	R:FXD COMP 2200 OHM 10% 1/4W	
A4R32	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A4R33	0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	
A4R34	0684-2221	R:FXD COMP 2200 OHM 10% 1/4W	
A4R35	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A4R36	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R37	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R38	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R39	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R40	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R41	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R42	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R43	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R44	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R45	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A4R46	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R47	0684-2231	R:FXD COMP 22K OHM 10% 1/4W	
A4R48	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A4(CONTINUED)	
A4R49	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R50	0683-3335	R:FXD COMP 33K OHM 5% 1/4W	
A4R51	0684-1011	R:FXD COMP 100 OHM 10% 1/4W	
A4R52	0683-3635	R:FXD COMP 36K OHM 5% 1/4W	
A4R53	0683-3335	R:FXD COMP 33K OHM 5% 1/4W	
A4R54	0684-6821	R:FXD COMP 6.8K OHM 10% 1/4W	
A4R55	0683-3335	R:FXD COMP 33K OHM 5% 1/4W	
A4R56	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R57	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R58	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R59	0684-6821	R:FXD COMP 6.8K OHM 10% 1/4W	
A4R60	0684-4731	R:FXD COMP 47K OHM 10% 1/4W	
A4R61	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R62	0684-3931	R:FXD COMP 39K OHM 10% 1/4W	
A4R63	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R64	0683-4315	R:FXD COMP 430 OHM 5% 1/4W	
A4R65	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R66	0684-3931	R:FXD COMP 39K OHM 10% 1/4W	
A4R67	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A4R68	0684-8221	R:FXD COMP 8200 OHM 10% 1/4W	
A4R69	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R70	0684-3931	R:FXD COMP 39K OHM 10% 1/4W	
A4R71	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R72	0683-4315	R:FXD COMP 430 OHM 5% 1/4W	
A4R73	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R74	0684-3931	R:FXD COMP 39K OHM 10% 1/4W	
A4R75	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R76	0684-8221	R:FXD COMP 8200 OHM 10% 1/4W	
A4R77	0684-8221	R:FXD COMP 8200 OHM 10% 1/4W	
A4R78	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R79	0684-3931	R:FXD COMP 39K OHM 10% 1/4W	
A4R80	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R81	0683-4315	R:FXD COMP 430 OHM 5% 1/4W	
A4R82	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R83	0684-3931	R:FXD COMP 39K OHM 10% 1/4W	
A4R84	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R85	0684-8221	R:FXD COMP 8200 OHM 10% 1/4W	
A4R86	0684-8221	R:FXD COMP 8200 OHM 10% 1/4W	
A4R87	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R88	0684-3931	R:FXD COMP 39K OHM 10% 1/4W	
A4R89	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R90	0683-4315	R:FXD COMP 430 OHM 5% 1/4W	
A4R91	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R92	0684-3931	R:FXD COMP 39K OHM 10% 1/4W	
A4R93	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A4R94	0684-8221	R:FXD COMP 8200 OHM 10% 1/4W	
A4R95	0683-2015	R:FXD COMP 200 OHM 5% 1/4W	
A4R96	0683-1845	R:FXD COMP 180K OHM 5% 1/4W	
A4R97	0684-1011	R:FXD COMP 100 OHM 10% 1/4W	
A4R98	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A4R99		NOT ASSIGNED	
A4R100	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A4R101	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	
A4R102	0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A5 THRU A14	05050-6002 05050-2002	BOARD ASSY: COLUMN (SEE TABLE 5-3 FOR TQ) BOARD: BLANK PC	
A5C1	0160-0153	C: FXD MY 1000 PF 10% 200VDCW	
A5C2	0160-0939	C: FXD MICA 430 PF 5% 300 VDCW	
A5C3	0160-0939	C: FXD MICA 430 PF 5% 300 VDCW	
A5C4	0160-0939	C: FXD MICA 430 PF 5% 300 VDCW	
A5C5	0160-0939	C: FXD MICA 430 PF 5% 300 VDCW	
A5C6	0160-0153	C: FXD MY 1000 PF 10% 200VDCW	
A5C7	0140-0198	C: FXD MICA 200 PF 5%	
A5C8	0140-0198	C: FXD MICA 200 PF 5%	
A5C9	0160-0153	C: FXD MY 1000 PF 10% 200VDCW	
A5C10	0160-0153	C: FXD MY 1000 PF 10% 200VDCW	
A5C11	0150-0121	C: FXD CER 0.1UF +80%-20% 50VDCW	
A5C12	0160-0153	C: FXD MY 1000 PF 10% 200VDCW	
A5C13	0140-0198	C: FXD MICA 200 PF 5%	
A5C14	0160-0157	C: FXD MY 0.0047 UF 10% 200VDCW	
A5C15	0180-0235	C: FXD ELECT 56 UF 20% 75VDCW	
A5C16	0160-0153	C: FXD MY 1000 PF 10% 200VDCW	
A5C17	0160-0939	C: FXD MICA 430 PF 5% 300 VDCW	
A5C18	0160-0939	C: FXD MICA 430 PF 5% 300 VDCW	
A5C19	0160-0939	C: FXD MICA 430 PF 5% 300 VDCW	
A5C20	0160-0939	C: FXD MICA 430 PF 5% 300 VDCW	
A5C21	0140-0198	C: FXD MICA 200 PF 5%	
A5C22	0160-0153	C: FXD MY 1000 PF 10% 200VDCW	
A5C23	0140-0198	C: FXD MICA 200 PF 5%	
A5C24	0160-0153	C: FXD MY 1000 PF 10% 200VDCW	
A5C25	0160-0153	C: FXD MY 1000 PF 10% 200VDCW	
A5C26	0150-0121	C: FXD CER 0.1UF +80%-20% 50VDCW	
A5C27	0160-0153	C: FXD MY 1000 PF 10% 200VDCW	
A5C28	0140-0198	C: FXD MICA 200 PF 5%	
A5C29		NOT ASSIGNED	
A5C30		NOT ASSIGNED	
A5C31	0160-0157	C: FXD MY 0.0047 UF 10% 200VDCW	
A5C32	0180-0235	C: FXD ELECT 56 UF 20% 75VDCW	
A5CR1	5080-0059	HOLDER: DIODE	
A5CR2	5080-0059	HOLDER: DIODE	
A5CR3	5080-0059	HOLDER: DIODE	
A5CR4	5080-0059	HOLDER: DIODE	
A5CR5	1901-0096	DIODE: SILICON 120V	
A5CR6	1901-0096	DIODE: SILICON 120V	
A5CR7	1901-0096	DIODE: SILICON 120V	
A5CR8	1901-0096	DIODE: SILICON 120V	
A5CR9	1901-0096	DIODE: SILICON 120V	
A5CR10	1901-0096	DIODE: SILICON 120V	
A5CR11	1901-0096	DIODE: SILICON 120V	
A5CR12	1901-0096	DIODE: SILICON 120V	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A5 THRU A14(CONTINUED)	
A5CR13	1901-0096	DIODE:SILICON 120V	
A5CR14	1901-0025	DIODE:SILICON 100WV 100MA	
A5CR15	1901-0096	DIODE:SILICON 120V	
A5CR16	1901-0096	DIODE:SILICON 120V	
A5CR17	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A5CR18	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A5CR19	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A5CR20	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A5CR21	1884-0073	THYRISTOR:SILICON	
A5CR22	5080-0059	HOLDER:DIODE	
A5CR23	5080-0059	HOLDER:DIODE	
A5CR24	5080-0059	HOLDER:DIODE	
A5CR25	5080-0059	HOLDER:DIODE	
A5CR26	1901-0096	DIODE:SILICON 120V	
A5CR27	1901-0096	DIODE:SILICON 120V	
A5CR28	1901-0096	DIODE:SILICON 120V	
A5CR29	1901-0096	DIODE:SILICON 120V	
A5CR30	1901-0096	DIODE:SILICON 120V	
A5CR31	1901-0096	DIODE:SILICON 120V	
A5CR32	1901-0096	DIODE:SILICON 120V	
A5CR33	1901-0096	DIODE:SILICON 120V	
A5CR34	1901-0096	DIODE:SILICON 120V	
A5CR35	1901-0025	DIODE:SILICON 100WV 100MA	
A5CR36	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A5CR37	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A5CR38	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A5CR39	1884-0073	THYRISTOR:SILICON	
A5CR40	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A5CR41	1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	
A5CR42	1901-0049	DIODE:SILICON 50PIV	
A5CR43	1901-0049	DIODE:SILICON 50PIV	
A5F1	2110-0099	FUSE:1A 125V	
A5F2	2110-0099	FUSE:1A 125V	
A5Q1	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A5Q2	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A5Q3	1854-0071	TRANSISTOR:SILICON NPN	
A5Q4	1853-0020	TRANSISTOR:SILICON PNP	
A5Q5	1854-0071	TRANSISTOR:SILICON NPN	
A5Q6	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A5Q7	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A5Q8	1853-0020	TRANSISTOR:SILICON PNP	
A5R1	0683-1855	R:FXD COMP 1.8 MEGOHM 5% 1/4W	
A5R2	0684-4741	R:FXD COMP 470K OHM 10% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A5 THRU A14(CONTINUED)			
A5R3	0683-1855	R:FXD COMP 1.8 MEGOHM 5% 1/4W	
A5R4	0684-4741	R:FXD COMP 470K OHM 10% 1/4W	
A5R5	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A5R6	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A5R7	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A5R8	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A5R9	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A5R10	0684-3941	R:FXD COMP 390K OHM 10% 1/4W	
A5R11	0684-3941	R:FXD COMP 390K OHM 10% 1/4W	
A5R12	0684-2241	R:FXD COMP 220K OHM 10% 1/4W	
A5R13	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A5R14	0683-1235	R:FXD COMP 12K OHM 5% 1/4W	
A5R15	0684-2241	R:FXD COMP 220K OHM 10% 1/4W	
A5R16	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A5R17	0683-1235	R:FXD COMP 12K OHM 5% 1/4W	
A5R18	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A5R19	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A5R20	0684-2211	R:FXD COMP 220 OHM 10% 1/4W	
A5R21	0684-2231	R:FXD COMP 22K OHM 10% 1/4W	
A5R22	0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	
A5R23	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A5R24	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A5R25	0684-1011	R:FXD COMP 100 OHM 10% 1/4W	
A5R26	0684-2231	R:FXD COMP 22K OHM 10% 1/4W	
A5R27	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A5R28	0684-2211	R:FXD COMP 220 OHM 10% 1/4W	
A5R29	0684-4701	R:FXD COMP 47 OHM 10% 1/4W	
A5R30	0811-1788	R:FXD WW 15 OHM 5% 2W	
A5R31	0683-1855	R:FXD COMP 1.8 MEGOHM 5% 1/4W	
A5R32	0683-1855	R:FXD COMP 1.8 MEGOHM 5% 1/4W	
A5R33	0684-4741	R:FXD COMP 470K OHM 10% 1/4W	
A5R34	0684-3941	R:FXD COMP 390K OHM 10% 1/4W	
A5R35	0684-3941	R:FXD COMP 390K OHM 10% 1/4W	
A5R36	0684-4741	R:FXD COMP 470K OHM 10% 1/4W	
A5R37	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A5R38	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A5R39	0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	
A5R40	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A5R41	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A5R42	0683-1235	R:FXD COMP 12K OHM 5% 1/4W	
A5R43	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A5R44	0684-2241	R:FXD COMP 220K OHM 10% 1/4W	
A5R45	0684-2241	R:FXD COMP 220K OHM 10% 1/4W	
A5R46	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A5R47	0683-1235	R:FXD COMP 12K OHM 5% 1/4W	
A5R48	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A5R49	0684-2211	R:FXD COMP 220 OHM 10% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A5 THRU A14 (CONTINUED)	
A5R50	0684-2231	R:FXD COMP 22K OHM 10% 1/4W	
A5R51	0684-2231	R:FXD COMP 22K OHM 10% 1/4W	
A5R52	0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	
A5R53	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A5R54	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A5R55	0684-1011	R:FXD COMP 100 OHM 10% 1/4W	
A5R56	0684-2211	R:FXD COMP 220 OHM 10% 1/4W	
A5R57	0684-4701	R:FXD COMP 47 OHM 10% 1/4W	
A5R58	0811-1788	R:FXD WW 15 OHM 5% 2W	
A5R59	0684-2241	R:FXD COMP 220K OHM 10% 1/4W	
A5R60	0684-2241	R:FXD COMP 220K OHM 10% 1/4W	
MISC.	5080-0058	JUMPER:PLUG-IN	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A15	05050-6015	MECHANISM ASSY	
A15B1	3140-0264	MOTOR:SINGLE PHASE 115V	
A15C1	0160-2368	C: AC 3 UF 10% 330VAC	
A15CR1	1901-0081	DIODE:SILICON 50 VOLTS WORKING	
A15L1	9100-1739	COIL:MAGNET 15 OHM	
A15L2		NSR:PART OF A15MP100	
A15L3		NSR:PART OF A15MP100	
A15L4		NSR:PART OF A15MP100	
A15L5		NSR:PART OF A15MP100	
A15L6		NSR:PART OF A15MP100	
A15L7		NSR:PART OF A15MP100	
A15L8		NSR:PART OF A15MP100	
A15L9		NSR:PART OF A15MP100	
A15L10		NSR:PART OF A15MP100	
A15L11		NSR:PART OF A15MP100	
A15L12		NSR:PART OF A15MP100	
A15L13		NSR:PART OF A15MP100	
A15L14		NSR:PART OF A15MP100	
A15L15		NSR:PART OF A15MP100	
A15L16		NSR:PART OF A15MP100	
A15L17		NSR:PART OF A15MP100	
A15L18		NSR:PART OF A15MP100	
A15L19		NSR:PART OF A15MP100	
A15MP1	05050-4026	DEFLECTOR PAPER	
A15MP2	9260-0071	ROLL:INK PLASTIC	
A15MP3	05050-2040	DISK CODE +1248	
	05050-2047	DISK CODE -1248	
	05050-2020	DISK CODE +1224	
A15P1	1251-0389	CONNECTOR:R & P MALE 24 CONTACT	
A15P2	1251-0483	CONNECTOR:R & P MALE 36 CONTACT PLUG	
A15A1	05050-6008	BOARD ASSY:CODE GENERATOR	
	05050-2008	BOARD:BLANK PC	
A15A1C1	0160-0820	C:FXD CER 0.05 UF +80-20% 25VDCW	
A15A1C2	0160-0820	C:FXD CER 0.05 UF +80-20% 25VDCW	
A15A1C3	0160-0820	C:FXD CER 0.05 UF +80-20% 25VDCW	
A15A1C4	0160-0820	C:FXD CER 0.05 UF +80-20% 25VDCW	
A15A1C5	0160-0820	C:FXD CER 0.05 UF +80-20% 25VDCW	
A15A1CR1	1990-0050	PHOTOSWITCH:15V	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A15(CONTINUED)	
A15A1CR2	1990-0050	PHOTOSWITCH:15V	
A15A1CR3	1990-0050	PHOTOSWITCH:15V	
A15A1CR4	1990-0050	PHOTOSWITCH:15V	
A15A1CR5	1990-0050	PHOTOSWITCH:15V	
A15A1R1	0757-0958	R:FXD MET FLM 27K OHM 2% 1/8W	
A15A1R2	0757-0958	R:FXD MET FLM 27K OHM 2% 1/8W	
A15A1R3	0757-0958	R:FXD MET FLM 27K OHM 2% 1/8W	
A15A1R4	0757-0958	R:FXD MET FLM 27K OHM 2% 1/8W	
A15A1R5	0757-0940	R:FXD MET FLM 4.7K OHM 2% 1/8W	
A15A1R6	0757-0958	R:FXD MET FLM 27K OHM 2% 1/8W	
A15A2	C5050-6009	BOARD ASSY:CODE LIGHT	
	C5050-2009	BOARD:BLANK PC	
A15A2DS1	2140-0094	LAMP:INCANDESCENT 5.3V	
A15A2DS2	2140-0094	LAMP:INCANDESCENT 5.3V	
A15A2DS3	2140-0094	LAMP:INCANDESCENT 5.3V	
A15A2DS4	2140-0094	LAMP:INCANDESCENT 5.3V	
A15A2DS5	2140-0094	LAMP:INCANDESCENT 5.3V	

See introduction to this section for ordering information

Figure 5-1. A15 Mechanism Assembly Parts

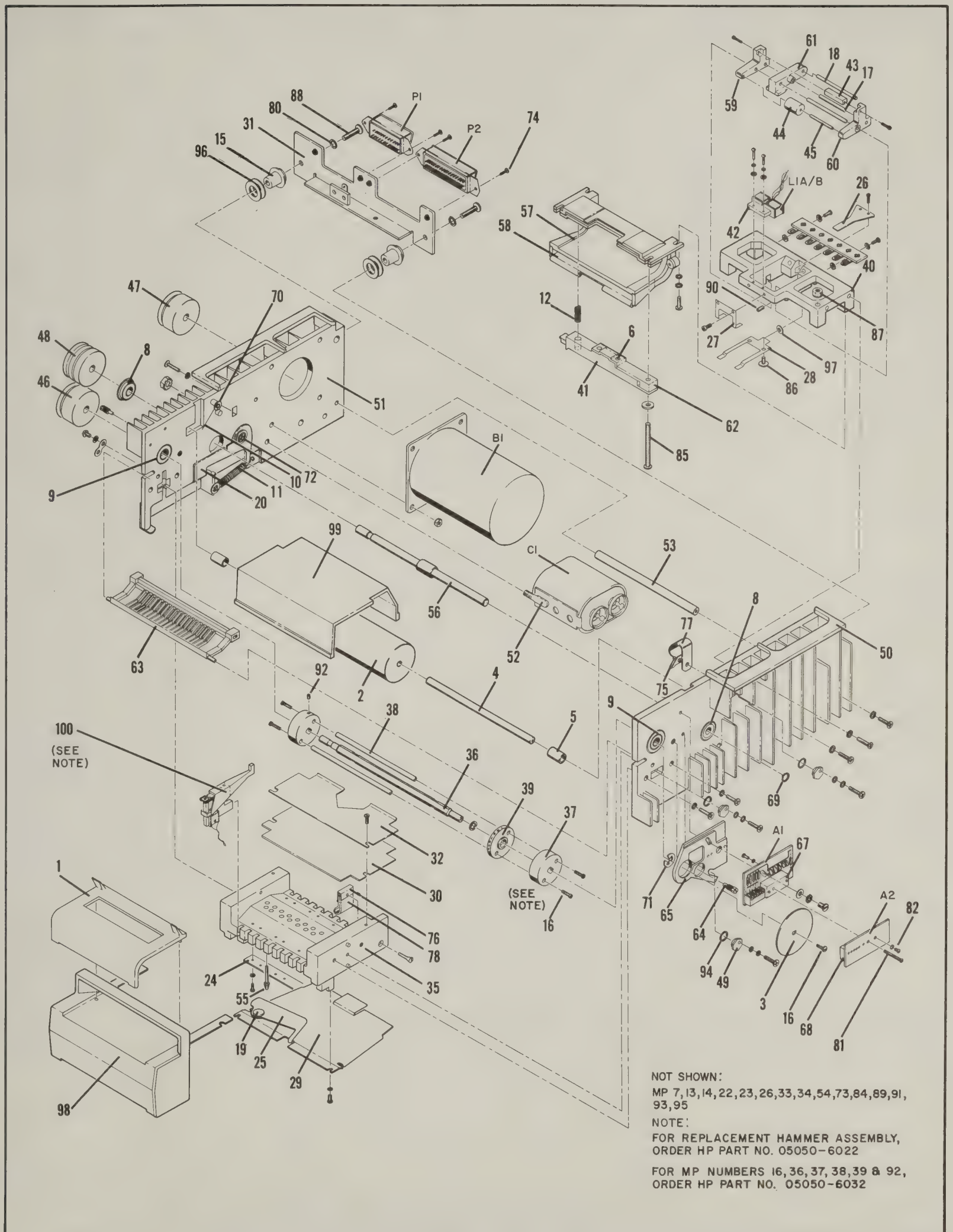


Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A15 MECHANICAL PARTS NOTES: 1. MP NUMBERS REFER TO FIGURE 5-1 2. THESE PARTS ARE NOT LISTED IN TABLE 5-2.	
A15MP1	05050-4026	DEFLECTOR PAPER	TQ 1
A15MP2 ✓	9260-0071	ROLL:INK PLASTIC	1
A15MP3	05050-2040	DISK CODE +1248	1
	05050-2047	DISK CODE -1248	1
	05050-2020	DISK CODE +1224	1
A15MP4 ✓	5020-3320	SHAFT	1
A15MP5 ✓	1410-0905	BEARING:SLEEVE BRONZE	2
A15MP6	0340-0035	POST:TERMINAL	2
A15MP7	3050-0417	WASHER:SPRING STL 3/16" ID	1
A15MP8	1410-0015	BEARING:BALL 1/4"	2
A15MP9	1410-0041	BEARING:BALL 5/16 ID	2
A15MP10	1460-0751	SPRING:TORSION	2
A15MP11	1460-0755	SPRING:EXTENSION SST	1
A15MP12	1460-C757	SPRING:COMPRESSION SST	1
A15MP13	1500-0049	BELT DRIVE:FRONT	1
A15MP14	1500-0050	BELT DRIVE:REAR	1
A15MP15	1520-0051	MOUNT:SHOCK 10-24 THD	2
A15MP16		SCREW:SST SLOT DR 4-40 THD	4
A15MP16		WASHER:SPLIT LOCK	4
A15MP17	5020-3321	SHAFT	1
A15MP18	5020-3322	SHAFT	2
A15MP19		PART OF A15MP29	1
A15MP20	05050-0001	LEVER:BRAKE BAR	1
A15MP21		NOT ASSIGNED	
A15MP22		NOT ASSIGNED	
A15MP23		NOT ASSIGNED	
A15MP24	05050-0005	CLAMP:HAMMER	2
A15MP25		PART OF A15MP29	1
A15MP26	05050-0011	SPRING-BRAKE:ARM	1
A15MP27	05050-0012	SPRING:DRIVE	1
A15MP28	05050-0013	SPRING:PAPER	1
A15MP29		GUIDE:ENTRY (ORDER BY DESCRIPTION)	1
A15MP30	05050-0020	GUIDE:EXIT BOTTOM	1
A15MP31	05050-0025	BRACKET:CONNECTOR	1
A15MP32	05050-0027	GUIDE:EXIT TOP	1
A15MP33		NOT ASSIGNED	
A15MP34		NOT ASSIGNED	
A15MP35	05050-2014	HOLDER:HAMMER	1
A15MP36	05050-2016	SHAFT:WHEEL	1
A15MP37	05050-2017	CLAMP:WHEEL	2
A15MP38	05050-2018	PIN:PRINT WHEEL	2
A15MP39	05050-6040	WHEEL:PRINT (REPLACEMENT)	18
A15MP40	05050-2021	FRAME:PAPER ADV	1
A15MP41	05050-2022	BAR:BRAKE	1

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		A15 MECHANICAL PARTS (CONTINUED)	
		TQ	
A15MP42	05050-2024	CORE PAPER ADV	1
A15MP43	05050-2025	ARMAT PAPER ADV	1
A15MP44	05050-2028	ROLLER PAPER DR	1
A15MP45	05050-2029	SHAFT WHEEL	1
A15MP46	05050-2030	PULLEY:SINGLE	1
	05050-2052	PULLEY:SINGLE 50 HZ	
A15MP47	05050-2030	PULLEY:SINGLE	2
A15MP48	05050-2031	PULLEY:DOUBLE	1
A15MP49	05050-2033	BUSHING:ECCEN	4
A15MP50	05050-2034	SIDEPLATE:RH	1
A15MP51	05050-2035	SIDEPLATE:LH	1
A15MP52	05050-2057	BRACKET:CAP	2
A15MP53	05050-2066	SPACER	
A15MP54		NOT ASSIGNED	18
A15MP55	05050-4002	SCREW:HAMMER ADJ	18
A15MP56	05050-4003	SHAFT:PAPER ADV	1
A15MP57	05050-4004	GUIDE:INSIDE PAPER	1
A15MP58	05050-4005	GUIDE:OUTSIDE PAPER	1
A15MP59	05050-4006	ROLLER ARM:LH	1
A15MP60	05050-4007	ROLLER ARM:RH	1
A15MP61	05050-4008	ARM BRAKE	1
A15MP62	05050-4010	BLOCK BRAKE	1
A15MP63	05050-4011	GUARD:PAPER(HARPSRING)	1
A15MP64	05050-4012	SCREW:GUARD ADJ	2
A15MP65	05050-4013	PLATE:CODE MOUNTING	1
A15MP66		NOT ASSIGNED	
A15MP67	05050-4014	BLOCK:PHOTRAN MOUNTING	1
A15MP68	05050-2043	BLOCK:LAMP MOUNTING	1
A15MP69	0510-0005	RING:RETAINER ST CP 1/4 INCH	1
A15MP70	0510-0042	RETAINER:PUSH-ON	2
A15MP71	0510-0083	RING:RETAINING	1
A15MP72	0510-1033	RETAINER:PUSH-ON	1
A15MP73	0517-0002	SCREW:SST SLOT DR # 1-72 THD	72
A15MP74	0525-0005	SCREW:SST RD HD 3-48 X 5/16	4
A15MP75	0590-0053	NUT:CAPTIVE 6-32	1
A15MP76	0590-0315	NUT:SHEET METAL 6-32	2
A15MP77	1400-0018	CLAMP:CABLE NYLON 7/16 DIA	1
A15MP78	1400-0024	CLAMP,CABLE NYLON 1/4 DIA	2
A15MP79	2190-0019	WASHER:LOCK BRONZE FOR #4 HDW	1
A15MP80	2190-0034	LOCKWASHER:SPLIT FOR #10 SCREW	2
A15MP81	2200-0010	SCREW:SST SLOT DR 4-40 THD	1
A15MP82	2200-0139	SCREW:SST PAN HD 4-40 THD	2
A15MP83	2220-0001	SCREW:SST SLOT DR 4-40 THD	2
A15MP84	2230-0024	SCREW:STL PAN HD 4-40 THD	1
A15MP85	2300-0135	SCREW:SST PAN HD 6-32 X 1-1/2"	1
A15MP86	2360-0055	SCREW:NYLON BH 6-32 THD	1
A15MP87	2420-0001	NUT:HEX ST NP 6-32 X 5/16 W/LOCKWASHER	1

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A15 MECHANICAL PARTS (CONTINUED)			
A15MP88	2920-0003	SCREW:SST RD HD SLOT DR 10-24 THD	2
A15MP89	3020-0078	SCREW:SOCKET CAP STL 1-72 THD	2
A15MP90	3030-0001	SCREW:MACHINE SET CUP-PT ST 8-32X3/16	4
A15MP91	3030-0002	SCREW:SET 8-32 X 3/8	6
A15MP92	3030-0033	SCREW:SET SST 6-32 X 3/16	4
A15MP93	3050-0019	WASHER:FLAT BRS 1/20D X 0.195ID	1
A15MP94	3050-0022	WASHER:FLAT BRASS RND 7/16 OD	4
A15MP95	3050-0066	WASHER:FLAT BRS FOR #6 SCREW	4
A15MP96	3050-0067	WASHER:FLAT BRS NP 5/8ODX3/8IDX0.031THK	4
A15MP97	3050-0159	WASHER:NYLON #6	2
A15MP98	05050-6031	COVER:HAMMER BLANK	1
A15MP99	05050-4028	COVER:INK ROLL	1
A15MP100	05050-6022	HAMMER ASSY	18
A16	05050-6003	BOARD ASSY:REGULATOR	
	05050-2003	BOARD:BLANK PC	
A16C1	0180-0094	C:FXD ELECT 100UF 25VDCW	
A16CR1	1901-0200	DIODE:SILICON 100 PIV 3A	
A16CR2	1901-0200	DIODE:SILICON 100 PIV 3A	
A16CR3	1901-0200	DIODE:SILICON 100 PIV 3A	
A16CR4	1901-0200	DIODE:SILICON 100 PIV 3A	
A16CR5	1901-0200	DIODE:SILICON 100 PIV 3A	
A16CR6	1901-0200	DIODE:SILICON 100 PIV 3A	
A16CR7	1901-0200	DIODE:SILICON 100 PIV 3A	
A16CR8	1901-0200	DIODE:SILICON 100 PIV 3A	
A16CR9	1901-0045	DIODE:SILICON 100PIV	
A16CR10	1901-0045	DIODE:SILICON 100PIV	
A16CR11	1901-0045	DIODE:SILICON 100PIV	
A16CR12	1901-0045	DIODE:SILICON 100PIV	
A16CR13	1902-3257	DIODE BREAKDOWN:23.7V 2%	
A16CR14	1902-3257	DIODE BREAKDOWN:23.7V 2%	
A16CR15	1902-0049	DIODE,BREAKDOWN: 6.19V 5%	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A16Q1	1850-0064	TRANSISTOR:GERMANIUM PNP 2N1183	
A16Q2	1850-0064	TRANSISTOR:GERMANIUM PNP 2N1183	
A16R1		NOT ASSIGNED	
A16R2	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A16R3	0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	
A16R4	0758-0044	R:FXD MET OX 2200 OHM 5% 1/2W	
A16R5	0758-0044	R:FXD MET OX 2200 OHM 5% 1/2W	
A16R6	0758-0015	R:FXD MET OX 220 OHM 5% 1/2W	
A16R7	2100-1770	R:VAR COMP 100 OHM 10% LIN 1/2W	
A16R8	0764-0017	R:FXD MET OX 1.6K OHM 5% 2W	
A16R9	0761-0021	R:FXD MET FLM 1K OHM 5% 1W	
A16R10	0761-0015	R:FXD MET FLM 1500 OHM 5% 1W	
A16R11	0761-0015	R:FXD MET FLM 1500 OHM 5% 1W	
A16R12	0761-0015	R:FXD MET FLM 1500 OHM 5% 1W	
A16R13	0811-1805	R:FXD WW 1500 OHM 5% 3W	
A16R14	0811-1202	R:FXD WW 50 OHM 5% 3W	
A16R15	0811-1202	R:FXD WW 50 OHM 5% 3W	
A16R16	0684-6801	R:FXD COMP 68 OHM 10% 1/4W	
A16R17	0684-6801	R:FXD COMP 68 OHM 10% 1/4W	
A16R18	0684-8201	R:FXD COMP 82 OHM 10% 1/4W	
A16R19	0684-8201	R:FXD COMP 82 OHM 10% 1/4W	
A16R20	0812-0040	R:FXD WW 0.27 OHM 5% 1/2W	
A16R21	0812-0040	R:FXD WW 0.27 OHM 5% 1/2W	
A17	05050-6007	BOARD ASSY:FILTER	
	05050-2007	BOARD:BLANK PC	
A17C1	0170-0060	C:FXD MY 0.047UF 10% 400VDCW	
A17C2	0170-0060	C:FXD MY 0.047UF 10% 400VDCW	
A17L1	9100-2407	COIL/CHOKE 8.8 MH	
A17L2	9100-2407	COIL/CHOKE 8.8 MH	
A18	05050-2065	BOARD:CONNECTOR	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A19	05050-6033	DIGITAL CLOCK BOARD ASSY (Option 55)	
A19C1-			
A19C4	0170-0082	C:FXD MY 0.01 UF 50VDCW	
A19C5	0160-0975	C:FXD CER 0.001 UF 75VDCW	
A19C6	0160-0157	C:FXD MY 0.0047 UF 200VDCW	
A19C7	0180-0235	C:FXD ELECT 56 UF 75VDCW	
A19C8	0160-0975	C:FXD CER 0.001 UF 75VDCW	
A19C9	0160-0157	C:FXD MY 0.0047 UF 200VDCW	
A19C10	0180-0235	C:FXD ELECT 56 UF 75VDCW	
A19C11, C12	0160-0975	C:FXD CER 0.001 UF 75VDCW	
A19C13	0160-0157	C:FXD MY 0.0047 UF 200VDCW	
A19C14	0180-0235	C:FXD ELECT 56 UF 75VDCW	
A19C15	0160-0157	C:FXD MY 0.0047 UF 200VDCW	
A19C16	0180-0235	C:FXD ELECT 56 UF 75VDCW	
A19C17, C18	0160-0975	C:FXD CER 0.001 UF 75VDCW	
A19C19	0160-0157	C:FXD MY 0.0047 UF 200VDCW	
A19C20	0180-0235	C:FXD ELECT 56 UF 75VDCW	
A19C21	0160-0157	C:FXD MY 0.0047 UF 200VDCW	
A19C22	0180-0235	C:FXD ELECT 56 UF 75VDCW	
A19C23	0160-0157	C:FXD MY 0.0047 UF 200VDCW	
A19C24	0180-0235	C:FXD ELECT 56 UF 75VDCW	
A19C25	0170-0083	C:FXD MY 0.022 UF 50VDCW	
A19C26	0160-0975	C:FXD CER 0.001 UF 75VDCW	
A19C27	0180-2150	C:FXD ELECT 1300 UF 15VDCW	
A19C28	0140-0196	C:FXD MICA 150 PF 300VDCW	
A19C29, C30	0180-0106	C:FXD ELECT 60 UF 6VDCW	
A19C31	0180-0373	C:FXD ELECT 0.68 UF 35VDCW	
A19C32	0170-0083	C:FXD MY 0.022 UF 50VDCW	
A19C33	0160-2204	C:FXD MICA 100 PF 300VDCW	
A19C34	0140-0196	C:FXD MICA 150 PF 300VDCW	
A19C35	0160-0975	C:FXD CER 0.001 UF 75VDCW	
A19C36	0180-1743	C:FXD ELECT 0.1 UF 35VDCW	
A19CR1-			
A19CR4	1902-0049	DIODE BREAKDOWN:6.19V	
A19CR5	1902-3002	DIODE BREAKDOWN:2.37V	
A19CR6	1884-0073	THYRISTOR:SILICON	
A19CR7	1901-0028	DIODE:SILICON 400PIV	
A19CR8	1884-0073	THYRISTOR:SILICON	
A19CR9	1901-0028	DIODE:SILICON 400PIV	
A19CR10	1910-0016	DIODE:GERMANIUM 60WIV	
A19CR11	1884-0073	THYRISTOR:SILICON	
A19CR12	1901-0028	DIODE:SILICON 400PIV	
A19CR13	1884-0073	THYRISTOR:SILICON	
A19CR14	1901-0028	DIODE:SILICON 400PIV	
A19CR15	1910-0016	DIODE:GERMANIUM 60WIV	
A19CR16	1884-0073	THYRISTOR:SILICON	
A19CR17	1901-0028	DIODE:SILICON 400PIV	
A19CR18	1884-0073	THYRISTOR:SILICON	
A19CR19	1901-0028	DIODE:SILICON 400PIV	
A19CR20	1884-0073	THYRISTOR:SILICON	
A19CR21	1901-0028	DIODE:SILICON 400PIV	
A19CR22, 23	1910-0016	DIODE:GERMANIUM 60WIV	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A19CR24-			
A19CR31	1901-0028	DIODE:SILICON 400PIV (Option 55)	
A19CR32, 33	1901-0081	DIODE:SILICON 50WV	
A19CR34	1902-3104	DIODE BREAKDOWN:5.62V	
A19CR35	1903-0008	DIODE, SYMMETRICAL:SILICON	
A19CR36	1902-3059	DIODE BREAKDOWN:3.83V	
A19CR37	1901-0081	DIODE:SILICON 50WV	
A19CR38	1902-3203	DIODE BREAKDOWN:14.7V	
A19DS1-			
A19DS6	1970-0025	ELECTRON TUBE:DISPLAY, 10 DIGIT	
A19F1-			
A19F7	2110-0099	FUSE:1A 125V	
A19IC1	1820-0116	INTEGRATED CIRCUIT	
A19IC2	1820-0092	INTEGRATED CIRCUIT	
A19IC3	1820-0116	INTEGRATED CIRCUIT	
A19IC4	1820-0119	INTEGRATED CIRCUIT	
A19IC5	1820-0118	INTEGRATED CIRCUIT	
A19IC6	1820-0054	INTEGRATED CIRCUIT	
A19IC7	1820-0092	INTEGRATED CIRCUIT	
A19IC8	1820-0116	INTEGRATED CIRCUIT	
A19IC9	1820-0119	INTEGRATED CIRCUIT	
A19IC10	1820-0118	INTEGRATED CIRCUIT	
A19IC11	1820-0054	INTEGRATED CIRCUIT	
A19IC12	1820-0092	INTEGRATED CIRCUIT	
A19IC13	1820-0116	INTEGRATED CIRCUIT	
A19IC14	1820-0119	INTEGRATED CIRCUIT	
A19IC15	1820-0118	INTEGRATED CIRCUIT	
A19IC16	1820-0092	INTEGRATED CIRCUIT	
A19IC17	1820-0116	INTEGRATED CIRCUIT	
A19IC18	1820-0119	INTEGRATED CIRCUIT	
A19IC19	1820-0118	INTEGRATED CIRCUIT	
A19IC20	1820-0054	INTEGRATED CIRCUIT	
A19IC21	1820-0092	INTEGRATED CIRCUIT	
A19IC22	1820-0116	INTEGRATED CIRCUIT	
A19IC23	1820-0119	INTEGRATED CIRCUIT	
A19IC24	1820-0118	INTEGRATED CIRCUIT	
A19IC25	1820-0092	INTEGRATED CIRCUIT	
A19IC26	1820-0116	INTEGRATED CIRCUIT	
A19IC27	1820-0119	INTEGRATED CIRCUIT	
A19IC28, 29	1820-0118	INTEGRATED CIRCUIT	
A19IC30	1820-0116	INTEGRATED CIRCUIT	
A19IC31	1820-0119	INTEGRATED CIRCUIT	
A19IC32	1820-0054	INTEGRATED CIRCUIT	
A19IC33	1820-0119	INTEGRATED CIRCUIT	
A19IC34	1820-0054	INTEGRATED CIRCUIT	
A19L1	9100-2276	COIL 100UH	
A19Q1-			
A19Q6	1854-0071	TRANSISTOR:SILICON NPN	
A19Q7, Q8	1853-0020	TRANSISTOR:SILICON PNP	
A19Q9	1854-0300	TRANSISTOR:SILICON NPN	
A19Q10-			
A19Q13	1854-0071	TRANSISTOR:SILICON NPN	
A19Q14	1853-0020	TRANSISTOR:SILICON PNP	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A19Q15- A19Q20	1854-0071	TRANSISTOR:SILICON NPN (Option 55)	
A19R1- A19R6 A19R7 A19R8 A19R9- A19R12	0684-4721 0684-4731 0684-1531 0684-2231	R:FXD COMP 4.7K OHM 10% 1/4W R:FXD COMP 47K OHM 10% 1/4W R:FXD COMP 15K OHM 10% 1/4W R:FXD COMP 22K OHM 10% 1/4W	
A19R13 A19R14 A19R15 A19R16 A19R17	0683-1025 0684-1531 0684-1041 0684-4721 0684-6831	R:FXD COMP 1K OHM 5% 1/4W R:FXD COMP 15K OHM 10% 1/4W R:FXD COMP 100K OHM 10% 1/4W R:FXD COMP 4.7K OHM 10% 1/4W R:FXD COMP 68K OHM 10% 1/4W	
A19R18 A19R19 A19R20, 21 A19R22 A19R23, 24	0683-1025 0811-1788 0684-1031 0684-6831 0684-1031	R:FXD COMP 1K OHM 5% 1/4W R:FXD WW 15 OHM 5% 2W R:FXD COMP 10K OHM 10% 1/4W R:FXD COMP 68K OHM 10% 1/4W R:FXD COMP 10K OHM 10% 1/4W	
A19R25 A19R26 A19R27 A19R28 A19R29	0683-1025 0684-4731 0811-1788 0683-1025 0684-6831	R:FXD COMP 1K OHM 5% 1/4W R:FXD COMP 47K OHM 10% 1/4W R:FXD WW 15 OHM 5% 2W R:FXD COMP 1K OHM 5% 1/4W R:FXD COMP 68K OHM 10% 1/4W	
A19R30 A19R31 A19R32 A19R33 A19R34, 35	0684-1031 0683-1025 0811-1788 0684-6831 0684-1031	R:FXD COMP 10K OHM 10% 1/4W R:FXD COMP 1K OHM 5% 1/4W R:FXD WW 15 OHM 5% 2W R:FXD COMP 68K OHM 10% 1/4W R:FXD COMP 10K OHM 10% 1/4W	
A19R36 A19R37 A19R38 A19R39 A19R40	0683-1025 0684-4731 0811-1788 0683-1025 0684-6831	R:FXD COMP 1K OHM 5% 1/4W R:FXD COMP 47K OHM 10% 1/4W R:FXD WW 15 OHM 5% 2W R:FXD COMP 1K OHM 5% 1/4W R:FXD COMP 68K OHM 10% 1/4W	
A19R41 A19R42 A19R43 A19R44 A19R45	0684-1031 0683-1025 0811-1788 0684-6831 0683-1025	R:FXD COMP 10K OHM 10% 1/4W R:FXD COMP 1K OHM 5% 1/4W R:FXD WW 15 OHM 5% 2W R:FXD COMP 68K OHM 10% 1/4W R:FXD COMP 1K OHM 5% 1/4W	
A19R46 A19R47 A19R48 A19R49, 50 A19R51	0811-1788 0683-1025 0811-1788 0684-1031 0683-1025	R:FXD WW 15 OHM 5% 2W R:FXD COMP 1K OHM 5% 1/4W R:FXD WW 15 OHM 5% 2W R:FXD COMP 10K OHM 10% 1/4W R:FXD COMP 1K OHM 5% 1/4W	
A19R52 A19R53 A19R54 A19R55 A19R56	0683-2725 0683-1025 0684-4721 0684-4731 0684-1031	R:FXD COMP 2.7K OHM 5% 1/4W R:FXD COMP 1K OHM 5% 1/4W R:FXD COMP 4.7K OHM 10% 1/4W R:FXD COMP 47K OHM 10% 1/4W R:FXD COMP 10K OHM 10% 1/4W	
A19R57 A19R58 A19R59 A19R60, 61 A19R62	0758-0024 0684-1031 0684-1041 0684-1031 0758-0063	R:FXD MET FLM 100 OHM 5% 1/2W R:FXD COMP 10K OHM 10% 1/4W R:FXD COMP 100K OHM 10% 1/4W R:FXD COMP 10K OHM 10% 1/4W R:FXD MET FLM 1.6K OHM 5% 1/2W	
A19R63 A19R64 A19R65 A19R66	0684-4721 0683-1025 0684-4721	R:FXD COMP 4.7K OHM 10% 1/4W R:FXD COMP 1K OHM 5% 1/4W R:FXD COMP 4.7K OHM 10% 1/4W NOT ASSIGNED	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A19R67	0683-1525	R:FXD COMP 1.5K OHM 5% 1/4W (Option 55)	
A19R68	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A19R69	0683-1525	R:FXD COMP 1.5K OHM 5% 1/4W	
A19R70	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A19R71	0758-0063	R:FXD MET FLM 1.6K OHM 5% 1/2W	
A19R72,73	0684-4721	R:FXD COMP 4.7K OHM 10% 1/4W	
A19R74	0683-3325	R:FXD COMP 3.3K OHM 5% 1/4W	
A19R75	0683-4325	R:FXD COMP 4.3K OHM 5% 1/4W	
A19R76	0684-3331	R:FXD COMP 33K OHM 10% 1/4W	
A19R77	0684-4721	R:FXD COMP 4.7K OHM 10% 1/4W	
A19R78	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A19R79	0684-4721	R:FXD COMP 4.7K OHM 10% 1/4W	
A19R80	0683-1335	R:FXD COMP 13K OHM 5% 1/4W	
A19R81	0684-4711	R:FXD COMP 470 OHM 10% 1/4W	
A19R82,83	0684-1031	R:FXD COMP 10K OHM 10% 1/4W	
A19R84	0684-2231	R:FXD COMP 22K OHM 10% 1/4W	
A19R85-			
A19R89	0683-1025	R:FXD COMP 1K OHM 5% 1/4W	
		MISCELLANEOUS	
	5080-0058	HOLDER:SHORTING	
	05050-0048	BRACKET:HEAT SINK	
	05050-2070	BOARD:BLANK PC	
A20	05050-6037	CLOCK TO HAMMER CABLE ASSY	
	1200-0063	RECEPTECLE:CLOCK BOARD CONNECTOR	
	5020-0176	INSULATOR:RECEPTACLE	
A21	05050-6034	NEON LAMP BOARD ASSY	
A21DS1-			
A21DS4	2140-0028	LAMP:NEON	
A21R1,R2	0684-1041	R:FXD COMP 100K OHM 10% 1/4W	
A22	05050-6045	CLOCK CONTROL BOARD ASSY	
A22F2	2110-0047	FUSE:1 AMP	
	1400-0110	FUSEHOLDER	
	1400-0210	FUSEHOLDER KNOB	
	1400-0111	FUSEHOLDER NUT	
A22S6	3100-2466	SWITCH:ROTARY PRINT INTERVAL	
A22S7,8,9	3101-1319	SWITCH:TOGGLE SPDT	
A22S10	3101-0956	SWITCH:TOGGLE DP3T SET RUN	
A22S11	3101-0957	SWITCH:TOGGLE DPST,ON OFF	
A22S12	3101-0033	SWITCH:SLIDE 115/230 VAC	
A22T2	9100-2790	TRANSFORMER:POWER	
	05050-0047	BRACKET:CLOCK	
	05050-6035	ASSY:CABLE,CLOCK CONTROL(INCL P1, 18 PIN CONNECTOR)	
	05216-4005	LIGHTPIPE	
A23	05050-6036	CLOCK TO PRINTER CABLE ASSY	
	1251-0135	CONNECTOR:15 PIN PC BOARD	
	562A-76C	HOOD:CONNECTOR	
	562A-12B	CLAMP:WIRE	
	05050-6044	CLOCK DOOR ASSY INCLUDES:	
	05050-0045	PANEL:CLOCK	
	05050-2069	CLAMP:HINGE	
	05050-2072	PIN:HINGE	
	05321-40001	WINDOW:DISPLAY	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
A24	05050-6042 05050-2076	MOTOR CONTROL ASSY (Option 15) BOARD:BLANK PC	
A24C1	0180-0160	C:FXD ELECT 22 UF 20% 35VDCW	
A24C2	0160-0939	C:FXD MICA 430 PF 5%	
A24C3	0160-0162	C:FXD MY 0.022 UF 10%	
A24C4	0160-0939	C:FXD MICA 430 PF 5%	
A24C5	0160-0162	C:FXD MY 0.022 UF 10%	
A24C6	0160-2403	C:FXD CER 1500 PF 20% 5000VDCW	
A24C7	0180-1745	C:FXD ELECT 1.5 UF 10% 20VDCW	
A24CR1,2	1900-0081	DIODE:SILICON	
A24CR3	1902-0049	DIODE BREAKDOWN:6.19V	
A24CR4-			
A24CR8	1901-0081	DIODE:SILICON	
A24CR9	1902-3182	DIODE BREAKDOWN:12.1V	
A24CR10,11	1901-0081	DIODE:SILICON	
A24Q1-			
A24Q5	1854-0071	TRANSISTOR:SILICON NPN	
A24Q6	1855-0010	TRANSISTOR:SILICON 2N2646	
A24Q7	1854-0071	TRANSISTOR:SILICON NPN	
A24Q8	1884-0054	THYRISTOR:SILICON	
A24Q9	1855-0010	TRANSISTOR:SILICON 2N2646	
A24Q10-			
A24Q12	1853-0076	TRANSISTOR:PNP 2N4082	
A24R1	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A24R2	0683-1055	R:FXD COMP 1 MEGOHM 5% 1/4W	
A24R3	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A24R4	0683-4735	R:FXD COMP 47K OHM 5% 1/4W	
A24R5	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A24R6	0683-2245	R:FXD COMP 220K OHM 5% 1/4W	
A24R7	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A24R8	0683-4745	R:FXD COMP 470K OHM 5% 1/4W	
A24R9	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A24R10	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A24R11	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A24R12	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A24R13	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A24R14	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A24R15	0683-1245	R:FXD COMP 120K OHM 5% 1/4W	
A24R16	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A24R17	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A24R18	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A24R19	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A24R20	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A24R21	0683-2735	R:FXD COMP 27K OHM 5% 1/4W	
A24R22	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A24R23	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	
A24R24	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A24R25	0683-1525	R:FXD COMP 1500 OHM 5% 1/4W	
A24R26	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A24R27	0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	
A24R28	0683-3335	R:FXD COMP 33K OHM 5% 1/4W	
A24R29	0683-1015	R:FXD COMP 100 OHM 5% 1/4W	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index

Reference Designation	Part No.	Description #	Note
A24R30	0683-2445	R:FXD COMP 240K OHM 5% 1/4W (Option 15)	
A24R31	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A24R32	0683-6835	R:FXD COMP 68K OHM 5% 1/4W	
A24R33	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A24R34	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A24R35	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A24R36	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A24R37	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A24R38	0683-1035	R:FXD COMP 10K OHM 5% 1/4W	
A24R39	0683-1045	R:FXD COMP 100K OHM 5% 1/4W	
A24S13	3101-0163 05050-6043 5040-0170 5000-0230	SWITCH:TOGGLE SPST CABLE ASSY GUIDE:PC BOARD INSULATOR:CONNECTOR	
J4	1251-0191	JACK:TELEPHONE EXT TIME BASE	
L1	9140-0136 05050-6044 05050-0046 05050-0049 0370-0193	INDUCTOR:FXD 22 UH ASSY:CLOCK DOOR PANEL:CLOCK SWITCHES BRACKET:DOOR LATCH KNOB:ROUND, PRINT INTERVAL	
B1	3160-0056	FAN:TUBE AXIAL 50-60 CYCLE	
C1	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
C2	0180-0040	C:FXD ELECT 1500UF 50VDCW	
C3	0180-0040	C:FXD ELECT 1500UF 50VDCW	
C4	0180-0040	C:FXD ELECT 1500UF 50VDCW	
C5	0180-0040	C:FXD ELECT 1500UF 50VDCW	
C6	0180-1847	C:FXD ELECT 2300 UF +50-10% 100VDCW	
C7	0180-1847	C:FXD ELECT 2300 UF +50-10% 100VDCW	
DS1	1450-0048	LAMP:NEON	
DS1	0510-0123	FASTENER:PUSH-ON TYPE	
DS2	1450-0132 0510-0123	INDICATOR:LIGHT,RED FASTENER:PUSH-ON TYPE	
F1	2110-0013	FUSE:CARTRIDGE 3.2 AMP 125V MAX SLOW BLOW (115V OPERATION)	
F1	2110-0005	FUSE:CARTRIDGE 1.6 AMP 125V (230V OPERATION)	
J1	1251-0484	CONNECTOR:R & P 36 CONTACT RECEPTACLE	
J2	1251-0388	CONNECTOR:R & P 24 CONTACT	
J3	1251-0148	CONNECTOR:POWER 3 PIN MALE	
Q1	1850-0098 1200-0041 1200-0077	TRANSISTOR:GERMANIUM PNP SELECTED SOCKET:TRANSISTOR INSULATOR:TRANSISTOR, MICA	
Q2	1850-0098 1200-0077 1200-0041	TRANSISTOR:GERMANIUM PNP SELECTED INSULATOR:TRANSISTOR, MICA SOCKET:TRANSISTOR	
Q3	1850-0098 1200-0077 1200-0041	TRANSISTOR:GERMANIUM PNP SELECTED INSULATOR:TRANSISTOR, MICA SOCKET:TRANSISTOR	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
Q4	1850-0098 1200-0077 1200-0041	TRANSISTOR:GERMANIUM PNP SELECTED INSULATOR:TRANSISTOR, MICA SOCKET:TRANSISTOR	
Q5	1850-0194 1200-0079 1200-0080	TRANSISTOR:GERMANIUM PNP 2N1523 WASHER:INSULATOR INSULATOR:TRANSISTOR MTG.	
Q6	1850-0194 1200-0079 1200-0080	TRANSISTOR:GERMANIUM PNP 2N1523 WASHER:INSULATOR INSULATOR:TRANSISTOR MTG.	
Q7		NOT ASSIGNED	
Q8	1850-0098 1200-0077 1200-0041	TRANSISTOR:GERMANIUM PNP SELECTED INSULATOR:TRANSISTOR, MICA SOCKET:TRANSISTOR	
Q9	1850-0098 1200-0077 1200-0041	TRANSISTOR:GERMANIUM PNP SELECTED INSULATOR:TRANSISTOR, MICA SOCKET:TRANSISTOR	
Q10	1853-0052 0340-0162 1200-0168	TRANSISTOR:SILICON PNP INSULATOR:TRANSISTOR SOCKET:TRANSISTOR	
Q11		NOT ASSIGNED	
Q12	1850-0195 1200-0079 1200-0080	TRANSISTOR:GERMANIUM PNP 2N1970 WASHER:INSULATOR INSULATOR:TRANSISTOR MTG.	
Q13	1850-0195 1200-0079 1200-0080	TRANSISTOR:GERMANIUM PNP 2N1970 WASHER:INSULATOR INSULATOR:TRANSISTOR MTG.	
R1	0684-1051	R:FXD COMP 1MEGOHM 1% 1/4W	
R2	2100-0278	R:VAR COMP 50K OHM 10% LIN 2W	
R3 THRU R15		NOT ASSIGNED	
R16	0684-3331	R:FXD COMP 33K OHM 10% 1/4W	
S1 THRU S4 S5	3101-0931 3101-0033	SWITCH ASSY:PUSHBUTTON SWITCH:SLIDE DPDT	
T1	9100-2507	TRANSFORMER	
W1	8120-0078	CABLE ASSY:POWER CORD	
XA1- XA15		NOT ASSIGNED	
XA16	1251-0233	CONNECTOR:PC 44 CONTACTS	
XF1	1400-0084	FUSEHOLDER:EXTRACTOR POST TYPE	
		MISCELLANEOUS	
	0510-0182 9281-0386 9281-0387 05050-2058 1251-2061	FASTENER:LATCH PAPER:FOLDED TAPE(STANDARD) PAPER:FOLDED TAPE(PRESSURE-SENSITIVE) BOARD:TERMINAL CONNECTOR:SINGLE CONTACT	
	5000-3395 5000-3396 5000-3397 5000-3398 0370-0162	LABEL:PUSHBUTTON "ON-OFF" LABEL:PUSHBUTTON "OPER" LABEL:PUSHBUTTON "MAN PRINT" LABEL:PUSHBUTTON "MAN SPACE" PUSHBUTTON:METER FUNCTION	

See introduction to this section for ordering information

Table 5-1. Reference Designation Index (cont'd)

Reference Designation	Part No.	Description #	Note
		CABINET AND CHASSIS PARTS	
	05050- 0040	HOLDER:PAPER	
	05050-0041	PANEL:MECHANISM,RT SIDE FRONT	
	05050-0042	PANEL SWITCH:CENTER FRONT	
	05050-2067	FRAME RECORDER,FRONT	
	05050-4023	TRAY:PAPER	
	05050-4015	DOOR:PAPER	
	05050-4016	DOOR:PULL-PAPER	
	05050-4022	COVER:PAPER TRAY	
	05050-4009	LATCH:PANEL(MECHANISM)	
	05050-2048	FRAME ASSY	
	5060-0763	HANDLE ASSY-SIDE	
	5060-0765	RETAINER-HANDLE ASSY.	
	5000-0746	SIDE COVER	
	5060-0227	COVER ASSY:TOP	
	5060-0228	COVER ASSY:BOTTOM	
	5060-0767	FOOT ASSY:FM	
	1490-0030	STAND:TILT	
	05050-4019	MECH-SLIDE:LH	
	05050-4020	MECH-SLIDE:RH	
	1520-0051	MOUNT:SHOCK 10-24 THD	
	05050-4021	GUIDE:PC BOARD	
	05050-0022	PANEL:REAR	
	05050-0024	DOOR:REAR ACCESS	
	05050-2041	HINGE:REAR DOOR	
	05050-6016	KIT:RACK MOUNT	
	5020-0712	BRACKET:RACK MOUNT	
	5020-0713	BRACKET:RACK MOUNT (RH)	
	05050-8001	STRIP:FILLER	

See introduction to this section for ordering information

Table 5-2. Replaceable Parts

Stock No.	Description #	Mfr.	Mfr. Part No.	TQ	TQ	TQ
NOTE: THIS LIST DOES NOT INCLUDE TQ FOR:				Std	Option	
1. COLUMN BOARD ASSY A5 THRU A14 (SEE TABLE 5-3)				50	51	
2. MECHANICAL PARTS OF A15 (SEE TABLE 5-1)						
0140-0149	C:FXD MICA 47 UUF 5%	28480	0140-0149	4	4	4
0140-0196	C:FXD MICA 150 PF 5%	28480	0140-0196	1	3	3
0140-0197	C:FXD MICA 180 PF 5% 300 VDCW	04062	RDM15F181J3C	11	11	11
0150-0069	C:FXD CER 1000 PF +100-20% 500VDCW	72982	801-010X5G0102Z	2	1	1
0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA	6	8	8
0160-0153	C:FXD MY 1000 PF 10% 200VDCW	28480	0160-0153		1	1
0160-0154	C:FXD MYLAR 2200PF 10%	28480	0160-0154	1		
0160-0157	C:FXD MY 0.0047 UF 10% 200VDCW	28480	0160-0157	4	2	2
0160-0161	C:FXD MY 0.01 UF 10% 200VDCW	28480	0160-0161	4		
0160-0168	C:FXD MY 0.1 UF 10% 200VDCW	28480	0160-0168	4	2	1
0160-0299	C:FXD MY 1800 PF 10% 200VDCW	28480	0160-0299		4	4
0160-0362	C:FXD MICA 510PF 5%	28480	0160-0362		6	6
0160-0820	C:FXD CER 0.05 UF +80-20% 25VDCW	72982	5855 Y5U 503Z	5	5	5
0160-2188	C:FXD MY 3900 PF 5%	28480	0160-2188		6	6
0160-2208	C:FXD MICA 330 PF 5% 300VDCW	28480	0160-2208		2	2
0160-2368	C: AC 3 UF 10% 330VAC	82047	49F6438	1	1	1
0170-0019	C:FXD MY 0.1 UF 5% 200VDCW	28480	0170-0019	1	1	1
0170-0060	C:FXD MY 0.047UF 10% 400VDCW	84411	TYPE 663 UW	2	2	2
0180-0040	C:FXD ELECT 1500UF 50VDCW	56289	D32475	4	4	4
0180-0094	C:FXD ELECT 100UF 25VDCW	56289	30D107G025DH4	1	1	1
0180-0117	C:FXD ELECT TA 2.7UF 10% 35VDCW	56289	150D275X9035 B2	1	1	1
0180-0159	C:FXD ELECT 220 UF 10% 10VDCW	28480	0180-0159	1	1	1
0180-0229	C:FXD ELECT 33 UF 10% 10VDCW	28480	0180-0229		2	1
0180-0291	C:FXD ELECT 1UF 10% 35VDCW	56289	150D105X9035A2	2	2	2
0180-0376	C:FXD ELECT 0.47 UF 10% 35VDCW	56289	150D474X9035A2	1	1	1
0180-1746	C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746	1	1	1
0180-1773	C:FXD ELECT 0.68 UF 5% 35VDCW	56289	150D684X5035A2	2	2	2
0180-1847	C:FXD ELECT 2300 UF +50-10% 100VDCW	28480	0180-1847	2	2	2
0180-2150	C:FXD ELECT 1300 UF +75-10% 15VDCW	56289	601D138G015GJ4DHC		2	1
0340-0162	INSULATOR:TRANSISTOR	28480	0340-0162	1	1	1
0370-0162	PUSHBUTTON:METER FUNCTION	28480	0370-0162	4	4	4
0510-0123	FASTENER:PUSH-ON TYPE	78553	C12008-014-4	2	2	2
0510-0182	FASTENER:LATCH	94222	27-10-301-30	2	2	2
0683-1015	R:FXD COMP 100 OHM 5% 1/4W	01121	CB 1015		1	1
0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025		9	9
0683-1035	R:FXD COMP 10K OHM 5% 1/4W	01121	CB 1035	9	28	27
0683-1045	R:FXD COMP 100K OHMS 5% 1/4W	01121	CB 1045		2	2
0683-1065	R:FXD COMP 10M OHM 5% 1/4W	01121	CB 1065		1	1
0683-1235	R:FXD COMP 12K OHM 5% 1/4W	01121	CB 1235	1	1	1
0683-1335	R:FXD COMP 13K OHM 5% 1/4W	01121	CB 1335	7	1	1
0683-1535	R:FXD COMP 15K OHM 5% 1/4W	01121	CB 1535		4	4
0683-1845	R:FXD COMP 180K OHM 5% 1/4W	01121	CB 1845	1	1	1
0683-2015	R:FXD COMP 200 OHM 5% 1/4W	01121	CB 2015	1	1	1
0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	01121	CB 2025		5	5
0683-2035	R:FXD COMP 20K OHM 5% 1/4W	01121	CB 2035	1	7	7
0683-2245	R:FXD COMP 220K OHM 5% 1/4W	01121	CB 2245		80	40
0683-2435	R:FXD COMP 24K OHM 5% 1/4W	01121	CB 2435	8		
0683-2735	R:FXD COMP 27K OHM 5% 1/4W	01121	CB 2735	4		
0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	01121	CB 3025	2	2	2
0683-3035	R:FXD COMP 30K OHM 5% 1/4W	01121	CB 3035	1	3	3
0683-3335	R:FXD COMP 33K OHM 5% 1/4W	01121	CB 3335	9	5	5
0683-3625	R:FXD COMP 3600 OHM 5% 1/4W	01121	CB 3625		4	4
0683-3635	R:FXD COMP 36K OHM 5% 1/4W	01121	CB 3635	1	1	1
0683-3925	R:FXD COMP 3900 OHM 5% 1/4W	01121	CB 3925	1		
0683-3935	R:FXD COMP 39K OHM 5% 1/4W	01121	CB 3935		8	8

See list of abbreviations in introduction to this section

Table 5-2. Replaceable Parts (Cont'd)

Stock No.	Description #	Mfr.	Mfr. Part No.	TQ	TQ	TQ
				Std	Option 50 51	
0683-4315	R:FXD COMP 430 OHM 5% 1/4W	01121	CB 4315	4	4	4
0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	01121	CB 4725	9		
0683-4735	R:FXD COMP 47K OHM 5% 1/4W	01121	CB 4735	2	1	1
0683-5125	R:FXD COMP 5100 OHM 5% 1/4W	01121	CB 5125		8	7
0683-5625	R:FXD COMP 5600 OHM 5% 1/4W	01121	CB 5625		3	3
0683-5635	R:FXD COMP 56K OHMS 5% 1/4W	01121	CB 5635	7	2	2
0683-6225	R:FXD COMP 6200 OHM 5% 1/4W	01121	CB 6225		4	4
0683-6835	R:FXD COMP 68K OHM 5% 1/4W	01121	CB 6835		1	1
0683-9115	R:FXD COMP 910 OHM 5% 1/4W	01121	CB 9115	1	1	1
0684-1011	R:FXD COMP 100 OHM 10% 1/4W	01121	CB 1011	2	2	2
0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	01121	CB 1021	15	7	7
0684-1031	R:FXD COMP 10K OHM 10% 1/4W	01121	CB 1031	25	25	25
0684-1041	R:FXD COMP 100K OHM 10% 1/4W	01121	CB 1041	5	5	5
0684-1051	R:FXD COMP 1MEGOHM 1% 1/4W	01121	CB 1051	3	1	1
0684-1061	R:FXD COMP 10 MEGOHM 10% 1/4W	01121	CB 1061	1		
0684-1221	R:FXD COMP 1.2K OHM 10% 1/4W	01121	CB 1221	1		
0684-2221	R:FXD COMP 2200 OHM 10% 1/4W	01121	CB 2221	4	4	4
0684-2231	R:FXD COMP 22K OHM 10% 1/4W	01121	CB 2231	1	1	1
0684-2721	R:FXD COMP 2700 OHM 10% 1/4W	01121	CB 2721	2		
0684-3331	R:FXD COMP 33K OHM 10% 1/4W	01121	CB 3331	1	1	1
0684-3911	R:FXD COMP 390 OHM 10% 1/4W	01121	CB 3911	2	1	1
0684-3921	R:FXD COMP 3900 OHM 10% 1/4W	01121	CB 3921	1	1	1
0684-3931	R:FXD COMP 39K OHM 10% 1/4W	01121	CB 3931	8	8	8
0684-4701	R:FXD COMP 47 OHM 10% 1/4W	01121	CB 4701	4		
0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721	17	17	17
0684-4731	R:FXD COMP 47K OHM 10% 1/4W	01121	CB 4731	2	2	2
0684-6801	R:FXD COMP 68 OHM 10% 1/4W	01121	CB 6801	2	2	2
0684-6821	R:FXD COMP 6.8K OHM 10% 1/4W	01121	CB 6821	4	4	4
0684-8201	R:FXD COMP 82 OHM 10% 1/4W	01121	CB 8201	2	2	2
0684-8221	R:FXD COMP 8200 OHM 10% 1/4W	01121	CB 8221	7	7	7
0684-8231	R:FXD COMP 82K OHM 10% 1/4W	01121	CB 8231	1		
0698-3443	R:FXD MET FLM 287 OHM 1% 1/8W	28480	0698-3443		2	1
0698-3688	R:FXD MET OX 18 OHM 5% 1W	28480	0698-3688	1	1	1
0757-0940	R:FXD MET FLM 4.7K OHM 2% 1/8W	28480	0757-0940	1	1	1
0757-0954	R:FXD MET FLM 18K OHM 2% 1/4W	28480	0757-0954		2	2
0757-0958	R:FXD MET FLM 27K OHM 2% 1/8W	28480	0757-0958	5	5	5
0758-0005	R:FXD MET OX 4700 OHM 5% 1/2W	28480	0758-0005		2	1
0758-0015	R:FXD MET OX 220 OHM 5% 1/2W	28480	0758-0015	1	1	1
0758-0023	R:FXD MET OX 240 OHM 5% 1/2W	28480	0758-0023		2	1
0758-0028	R:FXD MET OX 270 OHM 5% 1/2W	28480	0758-0028		1	1
0758-0044	R:FXD MET OX 2200 OHM 5% 1/2W	28480	0758-0044	2	2	2
0758-0070	R:FXD MET OX 1200 OHM 5% 1/2W	28480	0758-0070	1		
0761-0015	R:FXD MET FLM 1500 OHM 5% 1W	28480	0761-0015	3	3	3
0761-0021	R:FXD MET FLM 1K OHM 5% 1W	28480	0761-0021	1	1	1
0761-0026	R:FXD MET OX 220 OHM 5% 1W	28480	0761-0026	1		
0764-0017	R:FXD MET OX 1.6K OHM 5% 2W	28480	0764-0017	1	1	1
0811-1202	R:FXD WW 50 OHM 5% 3W	28480	0811-1202	2	2	2
0811-1805	R:FXD WW 1500 OHM 5% 3W	28480	0811-1805	1	1	1
0812-0040	R:FXD WW 0.27 OHM 5% 1/2W	28480	0812-0040	2	2	2
1200-0041	SOCKET:TRANSISTOR	71785	133-32-10-013	6	6	6
1200-0077	INSULATOR:TRANSISTOR, MICA	16037	#112	6	6	6
1200-0079	WASHER:INSULATOR	71785	294665	4	4	4
1200-0080	INSULATOR:TRANSISTOR MTG.	71785	294834	4	4	4
1200-0168	SOCKET:TRANSISTOR	28480	1200-0168	1	1	1

See list of abbreviations in introduction to this section

Table 5-2. Replaceable Parts (Cont'd)

Stock No.	Description #	Mfr.	Mfr. Part No.	TQ	TQ	TQ
				Std	Option 50	51
1251-0087	CONNECTOR:FEMALE 50-PIN MINAT	28480	1251-0087	2	2	1
1251-0148	CONNECTOR:POWER 3 PIN MALE	87930	1065-1	1	1	1
1251-0233	CONNECTOR:PC 44 CONTACTS	28480	1251-0233	1	1	1
1251-0388	CONNECTOR:R & P 24 CONTACT	28480	1251-0388	1	1	1
1251-0389	CONNECTOR:R & P MALE 24 CONTACT	28480	1251-0389	1	1	1
1251-0475	CONNECTOR:PC 6 CONTACT	28480	1251-0475		2	1
1251-0483	CONNECTOR:R & P MALE 36 CONTACT PLUG	28480	1251-0483	1	1	1
1251-0484	CONNECTOR:R & P 36 CONTACT RECEPTACLE	28480	1251-0484	1	1	1
1251-0498	CONNECTOR:PC 22 CONTACTS	28480	1251-0498	12	12	12
1251-1370	CONNECTOR:PC 50 CONTACT	04811	610-093DX-25	2	2	2
1251-2061	CONNECTOR:SINGLE CONTACT	00779	P51958	18	18	18
1400-0084	FUSEHOLDER:EXTRACTOR POST TYPE	79515	342014	1	1	1
1450-0048	LAMP:NEON	28480	1450-0048	1	1	1
1450-0132	INDICATOR:LIGHT,RED	28480	1450-0132	1	1	1
1490-0030	STAND:TILT	28480	1490-0030	1	1	1
1520-0051	MOUNT:SHOCK 10-24 THD	90030	A-1024	1	1	1
1820-0356	MICROCIRCUIT PACKAGE:TYPE 711	28480	1820-0356		20	10
1850-0064	TRANSISTOR:GERMANIUM PNP 2N1183	86684	2N1183	2	2	2
1850-0098	TRANSISTOR:GERMANIUM PNP SELECTED	28480	1850-0098	6	6	6
1850-0194	TRANSISTOR:GERMANIUM PNP 2N1523	16758	2N1523	2	2	2
1850-0195	TRANSISTOR:GERMANIUM PNP 2N1970	16758	2N1970	2	2	2
1853-0016	TRANSISTOR:SILICON PNP 2N3638	07263	2N3638	1	1	1
1853-0020	TRANSISTOR:SILICON PNP	28480	1853-0020	19	17	17
1853-0036	TRANSISTOR:SILICON PNP	28480	1853-0036		5	5
1853-0052	TRANSISTOR:SILICON PNP	04713	2N3740	1	1	1
1853-0073	TRANSISTOR	28480	1853-0073	1	1	1
1854-0022	TRANSISTOR:NPN SILICON	28480	1854-0022		4	2
1854-0071	TRANSISTOR:SILICON NPN	28480	1854-0071	6	13	12
1854-0087	TRANSISTOR:NPN SILICON 2N3417	28480	1854-0087		2	1
1854-0215	TRANSISTOR:SILICON NPN 2N3904	28480	1854-0215	6	8	8
1854-0300	TRANSISTOR:SILICON NPN	28480	1854-0300		2	1
1901-0040	DIODE:SILICON 30MA 30WV	28480	1901-0040		23	23
1901-0045	DIODE:SILICON 100PIV	28480	1901-0045	4	4	4
1901-0049	DIODE:SILICON 50PIV	28480	1901-0049		8	4
1901-0081	DIODE:SILICON 50 VOLTS WORKING	28480	1901-0081	43	88	68
1901-0200	DIODE:SILICON 100 PIV 3A	02735	1N4998	8	8	8
1902-0017	DIODE,BREAKDOWN:6.81V 10% 400 MW	28480	1902-0017	1	1	1
1902-0022	DIODE BREAKDOWN:2.67V	28480	1902-0022	1	1	1
1902-0025	DIODE,BREAKDOWN:10.0V 5% 400 MW	28480	1902-0025	2		
1902-0041	DIODE:BREAKDOWN 5.11V 5% 400MW	28480	1902-0041		2	1
1902-0048	DIODE BREAKDOWN:6.81V 5%	28480	1902-0048	2		
1902-0049	DIODE,BREAKDOWN: 6.19V 5%	28480	1902-0049	1	3	2
1902-0055	DIODE BREAKDOWN:14.7V 10%	28480	1902-0055	1	1	1
1902-0057	DIODE BREAKDOWN:6.49V	28480	1902-0057		1	1
1902-0783	DIODE:BREAKDOWN 16.2V 5%	28480	1902-0783		2	1
1902-3079	DIODE BREAKDOWN:SILICON 4.53V	28480	1902-3079	1	1	1
1902-3139	DIODE BREAKDOWN:SILICON 8.25V 5%	28480	1902-3139	2	4	4
1902-3257	DIODE BREAKDOWN:23.7V 2%	28480	1902-3257	2	2	2
1902-3357	DIODE BREAKDOWN:56.2V 5%	28480	1902-3357		2	1
1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	28480	1910-0016	5	17	16
1990-0050	PHOTOSWITCH:15V	28480	1990-0050	5	5	5
2100-0278	R:VAR COMP 50K OHM 10% LIN 2W	28480	2100-0278	1	1	1

See list of abbreviations in introduction to this section

Table 5-2. Replaceable Parts (Cont'd)

Stock No.	Description #	Mfr.	Mfr. Part No.	TQ	TQ	TQ
				Std	Option 50	51
2100-1770	R:VAR COMP 100 OHM 10% LIN 1/2W	28480	2100-1770	1	1	1
2100-1777	R:VAR WW 20K OHM 10% LIN 1/2W	28480	2100-1777		2	1
2110-0005	FUSE:CARTRIDGE 1.6 AMP 125V	71400	MDL 1.6	1	1	1
2110-0013	FUSE:CARTRIDGE 3.2 AMP 125V MAX SLOW BLOW	75915	31303.2	1	1	1
2140-0094	LAMP:INCANDESCENT 5.3V	92966	7153	5	5	5
3101-0033	SWITCH:SLIDE DPDT	79727	6510 C	1	1	1
3101-0931	SWITCH ASSY:PUSHBUTTON	28480	3101-0931	1	1	1
3101-0932	SWITCH:SLIDE DPDT	79727	6933	2	1	1
3140-0264	MOTOR:SINGLE PHASE 115V	28480	3140-0264	1	1	1
3160-0056	FAN:TUBE AXIAL 50-60 CYCLE	28480	3160-0056	1	1	1
5000-0746	SIDE COVER	28480	5000-0746	1	1	1
5000-3395	LABEL:PUSHBUTTON"ON-OFF"	28480	5000-3395	1	1	1
5000-3396	LABEL:PUSHBUTTON "OPER"	28480	5000-3396	1	1	1
5000-3397	LABEL:PUSHBUTTON "MAN PRINT"	28480	5000-3397	1	1	1
5000-3398	LABEL:PUSHBUTTON "MAN SPACE"	28480	5000-339,	1	1	1
5020-0712	BRACKET:RACK MOUNT	28480	5020-0712	1	1	1
5020-0713	BRACKET:RACK MOUNT (RH)	28480	5020-0713	1	1	1
5060-0227	COVER ASSY:TOP	28480	5060-0227	1	1	1
5060-0228	COVER ASSY:BOTTOM	28480	5060-0228	1	1	1
5060-0763	HANDLE ASSY-SIDE	28480	5060-0763	1	1	1
5060-0765	RETAINER-HANDLE ASSY.	28480	5060-0765	1	1	1
5060-0767	FOOT ASSY:FM	28480	5060-0767	1	1	1
8120-0078	CABLE ASSY:POWER CORD	28480	8120-0078	1	1	1
9100-1738	COIL/MAGNET 4.3 OHM	28480	9100-1738	18	18	18
9100-1739	COIL:MAGNET 15 OHM	28480	9100-1739	1	1	1
9100-2407	COIL:MAGNET 8.8 MH	76493	5220	2	2	2
9100-2507	TRANSFORMER	28480	9100-2507	1	1	1
9260-0071	ROLL:INK PLASTIC	28480	9260-0071	1	1	1
9281-0386	PAPER:FOLDED TAPE(STANDARD)	93632	0BD	1	1	1
9281-0387	PAPER:FOLDED TAPE(PRESSURE-SENSITIVE)	93632	0BD	1	1	1
05050-0008	PANEL:CONTROL(LEFT FRONT)	28480	05050-0008	1	1	1
05050-0009	PANEL:MECHANISM(RT FRONT)	28480	05050-0009	1	1	1
05050-0022	PANEL:REAR	28480	05050-0022	1	1	1
05050-0024	DOOR:REAR ACCESS	28480	05050-0024	1	1	1
05050-0029	EXTRUSION:TRIM	28480	05050-0029	1	1	1
05050-0031	INSERT:EXTRUSION	28480	05050-0031	1	1	1
05050-2001	BOARD:BLANK PC	28480	05050-2001	1	1	1
05050-2003	BOARD:BLANK PC	28480	05050-2003	1	1	1
05050-2004	BOARD:BLANK PC	28480	05050-2004	1	1	1
05050-2005	BOARD:BLANK PC	28480	05050-2005	1		
05050-2007	BOARD:BLANK PC	28480	05050-2007	1	1	1
05050-2008	BOARD:BLANK PC	28480	05050-2008	1	1	1
05050-2009	BOARD:BLANK PC	28480	05050-2009	1	1	1
05050-2020	DISK CODE +1224	28480	05050-2020	1	1	1
05050-2036	EXTRUSION:BOTTOM	28480	05050-2036	1	1	1
05050-2037	EXTRUSION:TOP	28480	05050-2037	1	1	1
05050-2040	DISK CODE +1248	28480	05050-2040	1	1	1
05050-2041	HINGE:REAR DUOR	28480	05050-2041	1	1	1
05050-2047	DISK CODE -1248	28480	05050-2047	1	1	1
05050-2048	FRAME ASSY	28480	05050-2048	1	1	1
05050-2058	BOARD:TERMINAL	28480	05050-2058	1	1	1
05050-2059	BOARD:BLANK PC	28480	05050-2059		1	1
05050-2060	BOARD:BLANK PC	28480	05050-2060	1		
05050-2061	BOARD:BLANK PC	28480	05050-2061	1		
05050-2062	BOARD:BLANK PC	28480	05050-2062		1	1

See list of abbreviations in introduction to this section

Table 5-2. Replaceable Parts (Cont'd)

Stock No.	Description #	Mfr.	Mfr. Part No.	TQ	TQ	TQ
				Std	Option 50	51
05050-2063	BOARD:BLANK PC	28480	05050-2063		1	
05050-2065	BOARD:CONNECTOR	28480	05050-2065	1	1	1
05050-4009	LATCH:PANEL (MECHANISM)	28480	05050-4009	1	1	1
05050-4015	DOOR:PAPER	28480	05050-4015	1	1	1
05050-4016	DOOR:PULL-PAPER	28480	05050-4016	1	1	1
05050-4019	MECH-SLIDE:LH	28480	05050-4019	1	1	1
05050-4020	MECH-SLIDE:RH	28480	05050-4020	1	1	1
05050-4021	GUIDE:PC BOARD	28480	05050-4021	1	1	1
05050-4022	COVER:PAPER TRAY	28480	05050-4022	1	1	1
05050-4023	TRAY:PAPER	28480	05050-4023	1	1	1
05050-4026	DEFLECTOR PAPER	28480	05050-4026	1	1	1
05050-6001	BOARD ASSY:MASTER	28480	05050-6001	1	1	1
05050-6003	BOARD ASSY:REGULATOR	28480	05050-6003	1	1	1
05050-6004	BOARD ASSY:TIMING	28480	05050-6004	1	1	1
05050-6005	BOARD ASSY:PRINT COMMAND	28480	05050-6005	1		
05050-6007	BOARD ASSY:FILTER	28480	05050-6007	1	1	1
05050-6008	BOARD ASSY:CODE GENERATOR	28480	05050-6008	1	1	1
05050-6009	BOARD ASSY:CODE LIGHT	28480	05050-6009	1	1	1
05050-6015	MECHANISM ASSY	28480	05050-6015	1	1	1
05050-6016	KIT:RACK MOUNT	28480	05050-6016	1	1	1
05050-6017	BOARD ASSY:STORAGE PRINT COMMAND	28480	05050-6017		1	1
05050-6018	BOARD ASSY:INPUT (STANDARD)	28480	05050-6018	1		
05050-6019	BOARD ASSY:INPUT	28480	05050-6019	1		1
05050-6020	BOARD ASSY:INPUT STORAGE	28480	05050-6020		1	1
05050-6021	BOARD ASSY:INPUT STORAGE	28480	05050-6021		1	
05050-8001	STRIP:FILLER	28480	05050-8001	1	1	1
562A-76D	HOOD:CONNECTOR	28480	562A-76D		1	1
562A-76P	HOOD:CONNECTOR	28480	562A-76P		1	

See list of abbreviations in introduction to this section

1	H.P.		
2	H.P.		
3	H.P.		
4	RCA		
5	H.P.		
6	DELCO		
7	DELCO		
8	FAIRCHILD		
9	H.P.		
10	MOTOROLA		
11	H.P.		
12	H.P.		
13	H.P.	OR CARTER SEMICONDUCTOR	
14	H.P.		
15	H.P.		
16	RCA		
17	H.P.		
18	H.P.		
19	H.P.		
20	H.P.		
21	H.P.		
22	H.P.		
23	H.P.		
24	H.P.		
25	H.P.		
26	H.P.		
27	H.P.		
28	BOSS	MDL 1.6	
29	LITTLE FUSE	31303.2	
30	HUDSON LAMP CO.	7153	
31	CONTINENTAL-WIDET ELECTRONICS CORP.	6510-C	
32	H.P.		
33	2N3740	MOT.	
34	2N301	CSR, MOTA, ELMA, SST, UPI	
35	2N1970	CSR, ETC, MOTA, GPD, NIS, SST	
36	LITTLE FUSE	275001	30w
37	H.P.		
38	H.P.		

Table 5-3. Replaceable Parts

Stock No.	Description #	Mfr.	Mfr. Part No.	TQ	RS
	TQ GIVEN FOR ONE "COLUMN BOARD ASSY" A5 THRU A14.				
0140-0198	C:FXD MICA 200 PF 5%	28480	0140-0198	6	
0150-0121	C:FXD CER 0.1UF +80%-20% 50VDCW	56289	5C50A	2	
0160-0153	C:FXD MY 1000 PF 10% 200VDCW	28480	0160-0153	10	
0160-0157	C:FXD MY 0.0047 UF 10% 200VDCW	28480	0160-0157	2	
0160-0939	C: FXD MICA 430 PF 5% 300 VDCW	28480	0160-0939	8	
0180-0235	C:FXD ELECT 56 UF 20% 75VDCW	56289	109D566X0075T2	2	
0683-1235	R:FXD COMP 12K OHM 5% 1/4W	01121	CB 1235	4	
0683-1855	R:FXD COMP 1.8 MEGOHM 5% 1/4W	01121	CB 1855	4	
0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	01121	GB 2225	2	
0683-4735	R:FXD COMP 47K OHM 5% 1/4W	01121	CB 4735	2	
0684-1011	R:FXD COMP 100 OHM 10% 1/4W	01121	CB 1011	2	
0684-1021	R:FXD COMP 1000 OHM 10% 1/4W	01121	CB 1021	2	
0684-1031	R:FXD COMP 10K OHM 10% 1/4W	01121	CB 1031	8	
0684-1041	R:FXD COMP 100K OHM 10% 1/4W	01121	CB 1041	8	
0684-2211	R:FXD COMP 220 OHM 10% 1/4W	01121	CB 2211	4	
0684-2231	R:FXD COMP 22K OHM 10% 1/4W	01121	CB 2231	4	
0684-2241	R:FXD COMP 220K OHM 10% 1/4W	01121	CB 2241	6	
0684-3941	R:FXD COMP 390K OHM 10% 1/4W	01121	CB 3941	4	
0684-4701	R:FXD COMP 47 OHM 10% 1/4W	01121	CB 4701	2	
0684-4721	R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721	2	
0684-4741	R:FXD COMP 470K OHM 10% 1/4W	01121	CB 4741	4	
0811-1788	R:FXD WW 15 OHM 5% 2W	28480	0811-1788	2	
1853-0020	TRANSISTOR:SILICON PNP	28480	1853-0020	2	
1854-0071	TRANSISTOR:SILICON NPN	28480	1854-0071	2	
1854-0215	TRANSISTOR:SILICON NPN 2N3904	28480	1854-0215	4	
1884-0013	RECTIFIER:SILICON CONTROLLED 1.6A	28480	1884-0013	2	
1901-0025	DIODE:SILICON 100WV 100MA	28480	1901-0025	2	
1901-0049	DIODE:SILICON 50PIV	28480	1901-0049	2	
1901-0096	DIODE:SILICON 120V	28480	1901-0096	20	
1910-0016	DIODE:GERMANIUM 100MA AT 0.85V 60PIV	28480	1910-0016	9	
2110-0099	FUSE:1A 125V	75915	275001	2	
05050-2002	BOARD:BLANK PC	28480	05050-2002	1	
05050-6002	BOARD ASSY: COLUMN	28480	05050-6002	1	
5080-0058	JUMPER: PLUG-IN	28480	5080-0058	2	
5080-0059	HOLDER: DIODE	28480	5080-0059	8	

See list of abbreviations in introduction to this section

Table 5-4. Manufacturer's Code List

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
00000	U. S. A. Common	Any supplier of U. S.	05397	Union Carbide Corp., Linde Div., Kemet Dept.	Cleveland, Ohio	11242	Bay State Electronics Corp.	Waltham, Mass.
00136	McCoy Electronics	Mount Holly Springs, Pa.	05593	Illumitronic Engineering Co.	Sunnyvale, Calif.	11312	Teledyne Inc., Microwave Div.	Palo Alto, Calif.
00213	Sage Electronics Corp.	Rochester, N. Y.	05616	Cosmo Plastic	Cleveland, Ohio	11314	National Seal	Downey, Calif.
00287	Cemco Inc.	Danielson, Conn.		(c/o Electrical Spec. Co.)	Cleveland, Ohio	11534	Duncan Electronics Inc.	Costa Mesa, Calif.
00334	Humidial	Colton, Calif.	05624	Barber Colman Co.	Rockford, Ill.	11711	General Instrument Corp., Semiconductor Div., Products Group	Newark, N. J.
00348	Microtron Co., Inc.	Valley Stream, N. Y.	05728	Tiffen Optical Co.	Roslyn Heights, Long Island, N. Y.	11717	Imperial Electronic, Inc.	Buena Park, Calif.
00373	Garlock Inc.	Cherry Hill, N. J.	05729	Metro-Tel Corp.	Westbury, N. Y.	11870	Melabs, Inc.	Palo Alto, Calif.
00656	Aerovox Corp.	New Bedford, Mass.	05783	Stewart Engineering Co.	Santa Cruz, Calif.	12136	Philadelphia Handle Co.	Camden, N. J.
00779	Amp. Inc.	Harrisburg, Pa.	05820	Wakefield Engineering Inc.	Wakefield, Mass.	12361	Grove Mfg. Co., Inc.	Shady Grove, Pa.
00781	Aircraft Radio Corp.	Boonton, N. J.	06004	Bassick Co., Div. of Stewart Warner Corp.	Bridgeport, Conn.	12574	Gulton Ind. Inc. Data System Div.	Albuquerque, N. M.
00815	Northern Engineering Laboratories, Inc.	Burlington, Wis.	06090	Raychem Corp.	Redwood City, Calif.	12697	Clarostat Mfg. Co.	Dover, N. H.
00853	Sangamo Electric Co., Pickens Div.	Pickens, S. C.	06175	Bausch and Lomb Optical Co.	Rochester, N. Y.	12728	Elmar Filter Corp.	W. Haven, Conn.
00866	Goe Engineering Co.	City of Industry, Cal.	06402	E. T. A. Products Co. of America	Chicago, Ill.	12859	Nippon Electric Co., Ltd.	Tokyo, Japan
00891	Carl E. Holmes Corp.	Los Angeles, Calif.	06540	Amatom Electronic Hardware Co., Inc.	New Rochelle, N. Y.	12881	Metex Electronics Corp.	Clark, N. J.
00929	Microlab Inc.	Livingston, N. J.	06555	Beede Electrical Instrument Co., Inc.	Penacook, N. H.	12930	Delta Semiconductor Inc.	Newport Beach, Calif.
01002	General Electric Co., Capacitor Dept.	Hudson Falls, N. Y.	06666	General Devices Co., Inc.	Indianapolis, Ind.	12954	Dickson Electronics Corp.	Scottsdale, Arizona
01009	Alden Products Co.	Brockton, Mass.	06751	Semcor Div. Components Inc.	Phoenix, Ariz.	13103	Thermolloy	Dallas, Texas
01121	Allen Bradley Co.	Milwaukee, Wis.	06812	Torrington Mfg. Co., West Div.	Van Nuys, Calif.	13396	Telefunken (GmbH)	Hanover, Germany
01255	Litton Industries, Inc.	Beverly Hills, Calif.	06980	Varian Assoc. Eimac Div.	San Carlos, Calif.	13835	Midland-Wright Div. of Pacific Industries, Inc.	Kansas City, Kansas
01281	TRW Semiconductors, Inc.	Lawndale, Calif.	07088	Kelvin Electric Co.	Van Nuys, Calif.	14099	Sem-Tech	Newbury Park, Calif.
01295	Texas Instruments, Inc., Transistor Products Div.	Dallas, Texas	07126	Digitran Co.	Pasadena, Calif.	14193	Calif. Resistor Corp.	Santa Monica, Calif.
01349	The Alliance Mfg. Co.	Alliance, Ohio	07137	Transistor Electronics Corp.	Minneapolis, Minn.	14298	American Components, Inc.	Conshohocken, Pa.
01589	Pacific Relays, Inc.	Van Nuys, Calif.	07138	Westinghouse Electric Corp. Electronic Tube Div.	Elmira, N. Y.	14433	ITT Semiconductor, A Div. of Int. Telephone & Telegraph Corp.	West Palm Beach, Fla.
01930	Amerock Corp.	Rockford, Ill.	07149	Filmohm Corp.	New York, N. Y.	14493	Hewlett-Packard Company	Loveland, Colo.
01961	Pulse Engineering Co.	Santa Clara, Calif.	07233	Cinch-Graphik Co.	City of Industry, Calif.	14655	Cornell Dublier Electric Corp.	Newark, N. J.
02114	Ferroxcube Corp. of America	Saugerties, N. Y.	07261	Avnet Corp.	Culver City, Calif.	14674	Corning Glass Works	Corning, N. Y.
02116	Wheelock Signals, Inc.	Long Branch, N. J.	07263	Fairchild Camera & Inst. Corp. Semiconductor Div.	Mountain View, Calif.	14752	Electro Cube Inc.	San Gabriel, Calif.
02286	Cole Rubber and Plastics Inc.	Sunnyvale, Calif.	07322	Minnesota Rubber Co.	Minneapolis, Minn.	14960	Williams Mfg. Co.	San Jose, Calif.
02660	Amphenol-Borg Electronics Corp.	Chicago, Ill.	07387	Birtcher Corp., The	Monterey Park, Calif.	15203	Webster Electronics Co.	New York, N. Y.
02735	Radio Corp. of America, Semiconductor and Materials Div.	Somerville, N. J.	07397	Sylvania Elect. Prod. Inc., Mt. View Operations	Mountain View, Calif.	15287	Scronics Corp.	Northridge, Calif.
02771	Vocaline Co. of America, Inc.	Old Saybrook, Conn.	07910	Technical Wire Products Inc.	Cranford, N. J.	15291	Adjustable Bushing Co.	N. Hollywood, Calif.
02777	Hopkins Engineering Co.	San Fernando, Calif.	07933	Raytheon Mfg. Co., Semiconductor Div.	Mountain View, Calif.	15558	Micron Electronics	Garden City, Long Island, N. Y.
03508	G. E. Semiconductor Prod. Dept.	Syracuse, N. Y.	07980	Hewlett-Packard Co., Boonton Radio Div.	Rockaway, N. J.	15566	Amprobe Inst. Corp.	Lynbrook, N. Y.
03705	Apex Machine & Tool Co.	Dayton, Ohio	08145	U. S. Engineering Co.	Los Angeles, Calif.	15631	Cabletronics	Costa Mesa, Calif.
03797	Eldema Corp.	Compton, Calif.	08289	Blinn, Delbert Co.	Pomona, Calif.	15772	Twentieth Century Coil Spring Co.	Santa Clara, Calif.
03877	Transitron Electric Corp.	Wakefield, Mass.	08358	Burgess Battery Co.	Niagara Falls, Ontario, Canada	15801	Fenwal Elect. Inc.	Framingham, Mass.
03888	Pyrofilm Resistor Co., Inc.	Cedar Knolls, N. J.	08524	Deutsch Fastener Corp.	Los Angeles, Calif.	15818	Ametco Inc.	Mt. View, Calif.
03954	Singer Co., Diehl Div. Finderle Plant	Sumerville, N. J.	08664	Bristol Co., The	Waterbury, Conn.	16037	Spruce Pine Mica Co.	Spruce Pine, N. C.
04009	Arrow, Hart and Hegeman Elect. Co.	Hartford, Conn.	08717	Sloan Company	Sun Valley, Calif.	16179	Omni-Spectra Inc.	Detroit, Ill.
04013	Taurus Corp.	Lambertville, N. J.	08718	ITT Cannon Electric Inc., Phoenix Div.	Phoenix, Arizona	16352	Computer Diode Corp.	Lodi, N. J.
04062	Arco Electronic Inc.	Great Neck, N. Y.	08792	CBS Electronics Semiconductor Operations, Div of C. B. S. Inc.	Lowell, Mass.	16688	Ideal Prec. Meter Co., Inc. De Jur Meter Div.	Brooklyn, N. Y.
04222	Hi-Q Division of Aerovox	Myrtle Beach, S. C.	08984	Mel-Rain	Indianapolis, Ind.	16758	Delco Radio Div. of G. M. Corp.	Kokoma, Ind.
04354	Precision Paper Tube Co.	Wheeling, Ill.	09026	Babcock Relays Div.	Costa Mesa, Calif.	17109	Thermonetics Inc.	Canoga Park, Calif.
04404	Dymec Division of Hewlett-Packard Co.	Palo Alto, Calif.	09134	Texas Capacitor Co.	Houston, Texas	17474	Tranex Company	Mountain View, Calif.
04651	Sylvania Electric Products, Microwave Device Div.	Mountain View, Calif.	09145	Tech. Ind. Inc. Atohm Elect.	Burbank, Calif.	17675	Hamlin Metal Products Corp.	Akron, Ohio
04713	Motorola, Inc., Semiconductor Prod. Div.	Phoenix, Arizona	09250	Electro Assemblies, Inc.	Chicago, Ill.	17745	Angstrom Prec. Inc.	No. Hollywood, Calif.
04732	Filtron Co., Inc. Western Div.	Culver City, Calif.	09569	Mallory Battery Co. of Canada, Ltd.	Toronto, Ontario, Canada	17870	McGraw-Edison Co.	Manchester, N. H.
04773	Automatic Electric Co.	Northlake, Ill.	10214	General Transistor Western Corp.	Los Angeles, Calif.	18042	Power Design Pacific Inc.	Palo Alto, Calif.
04796	Sequoia Wire Co.	Redwood City, Calif.	10411	Ti-Tal, Inc.	Berkeley, Calif.	18083	Clevite Corp., Semiconductor Div.	Palo Alto, Calif.
04811	Precision Coil Spring Co.	El Monte, Calif.	10646	Carborundum Co.	Niagara Falls, N. Y.	18324	Signetics Corp.	Sunnyvale, Calif.
04870	P. M. Motor Company	Westchester, Ill.	11236	CTS of Berne, Inc.	Berne, Ind.	18476	Ty-Car Mfg. Co., Inc.	Holliston, Mass.
04919	Component Mfg. Service Co.	W. Bridgewater, Mass.	11237	Chicago Telephone of California, Inc.	So. Pasadena, Calif.	18486	TRW Elect. Comp. Div.	Des Plaines, Ill.
05006	Twentieth Century Plastics, Inc.	Los Angeles, Calif.				18583	Curtis Instrument, Inc.	Mt. Kisco, N. Y.
05277	Westinghouse Electric Corp. Semi-Conductor Dept.	Youngwood, Pa.				18873	E. I. DuPont and Co., Inc.	Wilmington, Del.
05347	Ultronix, Inc.	San Mateo, Calif.				18911	Durant Mfg. Co.	Milwaukee, Wis.
						19315	The Bendix Corp., Navigation & Control Div.	Teterboro, N. J.
						19500	Thomas A. Edison Industries, Div. of McGraw-Edison Co.	West Orange, N. J.
						19589	Concoa	Baldwin Park, Calif.
						19644	LRC Electronics	Horseheads, N. Y.
						19701	Electra Mfg. Co.	Independence, Kansas

00015-44
Revised: September, 1967

From: FSC. Handbook Supplements
H4-1 Dated AUGUST 1966
H4-2 Dated NOV. 1962

Table 5-4. Manufacturer's Code List (cont'd)

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
20183	General Atronic Corp.	Philadelphia, Pa.	71436	Chicago Condenser Corp.	Chicago, Ill.	77252	Philadelphia Steel and Wire Corp.	Philadelphia, Pa.
21226	Executone, Inc.	Long Island City, N.Y.	71447	Calif. Spring Co., Inc.	Pico-Rivera, Calif.	77342	American Machine & Foundry Co. Potter & Brumfield Div.	Princeton, Ind.
21335	Fafnir Bearing Co., The	New Britain, Conn.	71450	CTS Corp.	Elkhart, Ind.	77630	TRW Electronic Components Div.	Camden, N.J.
21520	Fansteel Metallurgical Corp.	N. Chicago, Ill.	71468	ITT Cannon Electric Inc.	Los Angeles, Calif.	77638	General Instrument Corp., Rectifier Div.	Brooklyn, N.Y.
23783	British Radio Electronics Ltd.	Washington, D.C.	71471	Cinema, Div. Aerovox Corp.	Burbank, Calif.	77764	Resistance Products Co.	Harrisburg, Pa.
24455	G.E. Lamp Division	Nela Park, Cleveland, Ohio	71482	C.P. Clare & Co.	Chicago, Ill.	77969	Rubbercraft Corp. of Calif.	Torrance, Calif.
24655	General Radio Co.	West Concord, Mass.	71590	Centralab Div. of Globe Union Inc.	Milwaukee, Wis.	78189	Shakeproof Division of Illinois Tool Works	Elgin, Ill.
24681	Memcor Inc., Comp. Div.	Huntington, Ind.	71616	Commercial Plastics Co.	Chicago, Ill.	78283	Signal Indicator Corp.	New York, N.Y.
26365	Gries Reproducer Corp.	New Rochelle, N.Y.	71700	Cornish Wire Co., The	New York, N.Y.	78290	Struthers-Dunn Inc.	Pitman, N.J.
26462	Grobet File Co. of America, Inc.	Carlstadt, N.J.	71707	Coto Coil Co., Inc.	Providence, R.I.	78452	Thompson-Bremer & Co.	Chicago, Ill.
26992	Hamilton Watch Co.	Lancaster, Pa.	71744	Chicago Miniature Lamp Works	Chicago, Ill.	78471	Tilley Mfg. Co.	San Francisco, Calif.
28480	Hewlett-Packard Co.	Palo Alto, Calif.	71785	Cinch Mfg. Co., Howard B. Jones Div.	Chicago, Ill.	78488	Stackpole Carbon Co.	St. Marys, Pa.
28520	Heyman Mfg. Co.	Kenilworth, N.J.	71984	Dow Corning Corp.	Midland, Mich.	78493	Standard Thomson Corp.	Waltham, Mass.
33173	G.E. Receiving Tube Dept.	Owensboro, Ky.	72136	Electro Motive Mfg. Co., Inc.	Willimantic, Conn.	78553	Tinnerman Products, Inc.	Cleveland, Ohio
35434	Lectrohm Inc.	Chicago, Ill.	72619	Dialight Corp.	Brooklyn, N.Y.	78790	Transformer Engineers	San Gabriel, Calif.
36196	Stanwyck Coil Products Ltd.	Hawkesbury, Ontario, Canada	72656	Indiana General Corp., Electronics Div.	Keasby, N.J.	78947	Ucinite Co.	Newtonville, Mass.
36287	Cunningham, W.H. & Hill, Ltd.	Toronto Ontario, Canada	72699	General Instrument Corp., Cap. Div.	Newark, N.J.	79136	Waldes Kohinoor Inc.	Long Island City, N.Y.
37942	P.R. Mallory & Co. Inc.	Indianapolis, Ind.	72765	Drake Mfg. Co.	Harwood Heights, Ill.	79142	Veeder Root, Inc.	Hartford, Conn.
39543	Mechanical Industries Prod. Co.	Akron, Ohio	72825	Hugh H. Eby Inc.	Philadelphia, Pa.	79251	Wenco Mfg. Co.	Chicago, Ill.
40920	Miniature Precision Bearings, Inc.	Keene, N.H.	72928	Gudeman Co.	Chicago, Ill.	79727	Continental-Wirt Electronics Corp.	Philadelphia, Pa.
42190	Muter Co.	Chicago, Ill.	72964	Robert M. Hadley Co.	Los Angeles, Calif.	79963	Zierick Mfg. Corp.	New Rochelle, N.Y.
43990	C.A. Norgren Co.	Englewood, Colo.	72982	Erie Technological Products, Inc.	Erie, Pa.	80031	Mepco Division of Sessions Clock Co.	Morristown, N.J.
44655	Ohmite Mfg. Co.	Skokie, Ill.	73061	Hansen Mfg. Co., Inc.	Princeton, Ind.	80120	Schnitzer Alloy Products Co.	Elizabeth, N.J.
46384	Penn Eng. & Mfg. Corp.	Doylestown, Pa.	73076	H.M. Harper Co.	Chicago, Ill.	80131	Electronic Industries Association. Any brand Tube meeting EIA Standards-Washington, DC.	Wallingford, Conn.
47904	Polaroid Corp.	Cambridge, Mass.	73138	Helipot Div. of Beckman Inst., Inc.	Fullerton, Calif.	80207	Unimax Switch, Div. Maxon Electronics Corp.	New York, N.Y.
48620	Precision Thermometer & Inst. Co.	Southampton, Pa.	73293	Hughes Products Division of Hughes Aircraft Co.	Newport Beach, Calif.	80223	United Transformer Corp.	Chicago, Ill.
49956	Microwave & Power Tube Div.	Waltham, Mass.	73445	Amperex Elect Co.	Hicksville, L.I., N.Y.	80248	Oxford Electric Corp.	Riverside, Calif.
52090	Rowan Controller Co.	Westminster, Md.	73506	Bradley Semiconductor Corp.	New Haven, Conn.	80411	Acro Div. of Robertshaw Controls Co.	Columbus, Ohio
52983	Sanborn Company	Waltham, Mass.	73559	Carling Electric, Inc.	Hartford, Conn.	80486	All Star Products Inc.	Defiance, Ohio
54294	Shallcross Mfg. Co.	Selma, N.C.	73586	Circle F Mfg. Co.	Trenton, N.J.	80509	Avery Label Co.	Monrovia, Calif.
55026	Simpson Electric Co.	Chicago, Ill.	73682	George K. Garrett Co., Div. MSL Industries Inc.	Philadelphia, Pa.	80583	Hammarlund Co., Inc.	New York, N.Y.
55933	Sonotone Corp.	Elmsford, N.Y.	73734	Federal Screw Products Inc.	Chicago, Ill.	80640	Stevens, Arnold, Co., Inc.	Boston, Mass.
55938	Raytheon Co. Commercial Apparatus & Systems Div.	So. Norwalk, Conn.	73743	Fischer Special Mfg. Co.	Cincinnati, Ohio	81030	International Instruments Inc.	Orange, Conn.
56137	Spaulding Fibre Co., Inc.	Tonawanda, N.Y.	73793	General Industries Co., The	Elyria, Ohio	81073	Grayhill Co.	LaGrange, Ill.
56289	Sprague Electric Co.	North Adams, Mass.	73846	Goshen Stamping & Tool Co.	Goshen, Ind.	81095	Triad Transformer Corp.	Venice, Calif.
59446	Telex Corp.	Tulsa, Okla.	73899	JFD Electronics Corp.	Brooklyn, N.Y.	81312	Winchester Elec. Div. Litton Ind., Inc.	Oakville, Conn.
59730	Thomas & Betts Co.	Elizabeth, N.J.	73905	Jennings Radio Mfg. Corp.	San Jose, Calif.	81349	Military Specification	El Segundo, Calif.
60741	Triplett Electrical Inst. Co.	Bluffton, Ohio	73957	Groov-Pin Corp.	Ridgefield, N.J.	81483	International Rectifier Corp.	Cambridge, Maryland
61775	Union Switch and Signal, Div. of Westinghouse Air Brake Co.	Pittsburgh, Pa.	74276	Signalite Inc.	Neptune, N.J.	81541	Airpax Electronics, Inc.	Watertown, Mass.
62119	Universal Electric Co.	Owosso, Mich.	74455	J.H. Winns, and Sons	Winchester, Mass.	82042	Carter Precision Electric Co.	Skokie, Ill.
63743	Ward-Leonard Electric Co.	Mt. Vernon, N.Y.	74861	Industrial Condenser Corp.	Chicago, Ill.	82047	Sperli Faraday Inc., Copper Hewitt Electric Div.	Hoboken, N.J.
64959	Western Electric Co., Inc.	New York, N.Y.	74868	R.F. Products Division of Amphenol-Borg Electronics Corp.	Danbury, Conn.	82142	Jeffers Electronics Division of Spear Carbon Co.	Du Bois, Pa.
65092	Weston Inst. Inc. Weston-Newark	Newark, N.J.	74970	E.F. Johnson Co.	Waseca, Minn.	82170	Fairchild Camera & Inst. Corp. Space & Defense System Div.	Paramus, N.J.
66295	Wittke Mfg. Co.	Chicago, Ill.	75042	International Resistance Co.	Philadelphia, Pa.	82209	Maguire Industries, Inc.	Greenwich, Conn.
66346	Minnesota Mining & Mfg. Co. Revere Mincom Div.	St. Paul, Minn.	75378	CTS Knights Inc.	Sandwich, Ill.	82219	Sylvania Electric Prod. Inc. Electronic Tube Division	Emporium, Pa.
70276	Allen Mfg. Co.	Hartford, Conn.	75382	Kulka Electric Corporation	Mt. Vernon, N.Y.	82376	Astron Corp.	East Newark, Harrison, N.J.
70309	Allied Control	New York, N.Y.	75818	Lenz Electric Mfg. Co.	Chicago, Ill.	82389	Switchcraft, Inc.	Chicago, Ill.
70318	Allmetal Screw Product Co., Inc.	Garden City, N.Y.	75915	Littlefuse, Inc.	Des Plaines, Ill.	82647	Metals & Controls Inc. Spencer Products	Attleboro, Mass.
70485	Atlantic India Rubber Works, Inc.	Chicago, Ill.	76005	Lord Mfg. Co.	Erie, Pa.	82768	Phillips-Advance Control Co.	Joliet, Ill.
70563	Amperite Co., Inc.	Union City, N.J.	76210	C.W. Marwedel	San Francisco, Calif.	82866	Research Products Corp.	Madison, Wis.
70674	ADC Products Inc.	Minneapolis, Minn.	76433	General Instrument Corp., Micamold Division	Newark, N.J.	82877	Rotron Mfg. Co., Inc.	Woodstock, N.Y.
70903	Belden Mfg. Co.	Chicago, Ill.	76487	James Millen Mfg. Co., Inc.	Malden, Mass.	82893	Vector Electronic Co.	Glendale, Calif.
70998	Bird Electronic Corp.	Cleveland, Ohio	76493	J.W. Miller Co.	Los Angeles, Calif.			
71002	Birnbach Radio Co.	New York, N.Y.	76530	Cinch-Monadnock, Div. of United Carr Fastener Corp.	San Leandro, Calif.			
71041	Boston Gear Works Div. of Murray Co. of Texas	Quincy, Mass.	76545	Mueller Electric Co.	Cleveland, Ohio			
71218	Bud Radio, Inc.	Willoughby, Ohio	76703	National Union	Newark, N.J.			
71286	Camloc Fastener Corp.	Paramus, N.J.	76854	Oak Manufacturing Co.	Crystal Lake, Ill.			
71313	Cardwell Condenser Corp.	Lindenhurst L.I., N.Y.	77068	The Bendix Corp., Electrodynamics Div.	N. Hollywood, Calif.			
71400	Bussmann Mfg. Div. of McGraw-Edison Co.	St. Louis, Mo.	77075	Pacific Metals Co.	San Francisco, Calif.			
			77221	Phanostran Instrument and Electronic Co.	South Pasadena, Calif.			

Table 5-4. Manufacturer's Code List (cont'd)

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
83058	Carr Fastener Co.	Cambridge, Mass.	91418	Radio Materials Co.	Chicago, Ill.	97464	Industrial Retaining Ring Co.	Irvington, N. J.
83086	New Hampshire Ball Bearing, Inc.	Peterborough, N. H.	91506	Augat Inc.	Attleboro, Mass.	97539	Automatic & Precision Mfg.	Englewood, N. J.
83125	General Instrument Corp., Capacitor Div.	Darlington, S. C.	91637	Dale Electronics, Inc.	Columbus, Nebr.	97979	Reon Resistor Corp.	Yonkers, N. Y.
83148	ITT Wire and Cable Div.	Los Angeles, Calif.	91662	Elco Corp.	Willow Grove, Pa.	97983	Litton System Inc., Adler-Westrex Commun. Div.	New Rochelle, N. Y.
83186	Victory Eng. Corp.	Springfield, N. J.	91737	Gremar Mfg. Co., Inc.	Wakefield, Mass.	98141	R-Tronics, Inc.	Jamaica, N. Y.
83298	Bendix Corp., Red Bank Div.	Red Bank, N. J.	91827	K F Development Co.	Redwood City, Calif.	98159	Rubber Teck, Inc.	Gardena, Calif.
83315	Hubbell Corp.	Mundelein, Ill.	91886	Malco Mfg. Co., Inc.	Chicago, Ill.	98220	Hewlett-Packard Co., Moseley Div.	Pasadena, Calif.
83330	Smith, Herman H., Inc.	Brooklyn, N. Y.	91929	Honeywell Inc., Micro Switch Div.	Freeport, Ill.	98278	Microdot, Inc.	So. Pasadena, Calif.
83332	Tech Labs	Palisade's Park, N. J.	91961	Nahm-Bros. Spring Co.	Oakland, Calif.	98291	Sealectro Corp.	Mamaroneck, N. Y.
83385	Central Screw Co.	Chicago, Ill.	92180	Tru-Connector Corp.	Peabody, Mass.	98376	Zero Mfg. Co.	Burbank, Calif.
83501	Gavitt Wire and Cable Co. Div. of Amerace Corp.	Brookfield, Mass.	92367	Elgeet Optical Co. Inc.	Rochester, N. Y.	98731	General Mills Inc., Electronics Div.	Minneapolis, Minn.
83594	Burroughs Corp. Electronic Tube Div.	Plainfield, N. J.	92607	Tensolite Insulated Wire Co., Inc.	Tarrytown, N. Y.	98734	Paeco Div. of Hewlett-Packard Co.	Palo Alto, Calif.
83740	Union Carbide Corp. Consumer Prod. Div.	New York, N. Y.	92702	IMC Magnetics Corp.	Wesbury Long Island, N. Y.	98821	North Hills Electronics, Inc.	Glen Cove, N. Y.
83777	Model Eng. and Mfg., Inc.	Huntington, Ind.	92966	Hudson Lamp Co.	Kearney, N. J.	98978	International Electronic Research Corp.	Burbank, Calif.
83821	Loyd Scruggs Co.	Festus, Mo.	93332	Sylvania Electric Prod. Inc. Semiconductor Div.	Woburn, Mass.	99109	Columbia Technical Corp.	New York, N. Y.
83942	Aeronautical Inst. & Radio Co.	Lodi, N. J.	93369	Robbins & Myers Inc.	Palisades Park, N. J.	99313	Varian Associates	Palo Alto, Calif.
84171	Arco Electronics Inc.	Great Neck, N. Y.	93410	Stevens Mfg. Co., Inc.	Mansfield, Ohio	99378	Atlee Corp.	Winchester, Mass.
84396	A. J. Glesener Co., Inc.	San Francisco, Calif.	93929	G. V. Controls	Livingston, N. J.	99515	Marshall Ind., Capacitor Div.	Monrovia, Calif.
84411	TRW Capacitor Div.	Ogallala, Neb.	94137	General Cable Corp.	Bayonne, N. J.	99707	Control Switch Division, Controls Co. of America	El Segundo, Calif.
84970	Sarkes Tarzian, Inc.	Bloomington, Ind.	94144	Raytheon Co., Comp. Div., Ind. Comp. Operations	Quincy, Mass.	99800	Delevan Electronics Corp.	East Aurora, N. Y.
85454	Boonton Molding Company	Boonton, N. J.	94148	Scientific Electronics Products, Inc.	Loveland, Colo.	99848	Wilco Corporation	Indianapolis, Ind.
85471	A. B. Boyd Co.	San Francisco, Calif.	94154	Wagner Elect. Corp., Tung-Sol Div.	Newark, N. J.	99934	Renbrandt, Inc.	Boston, Mass.
85474	R. M. Bracamonte & Co.	San Francisco, Calif.	94197	Curtiss-Wright Corp. Electronics Div.	East Paterson, N. J.	99942	Hoffman Electronics Corp. Semiconductor Div.	El Monte, Calif.
85660	Korled Kords, Inc.	Hamden, Conn.	94222	South Chester Corp.	Chester, Pa.	99957	Technology Instrument Corp. of Calif.	Newbury Park, Calif.
85911	Seamless Rubber Co.	Chicago, Ill.	94330	Wire Cloth Products, Inc.	Bellwood, Ill.			
86197	Clifton Precision Products Co., Inc.	Clifton Heights, Pa.	94682	Worcester Pressed Aluminum Corp.	Worcester, Mass.			
86579	Precision Rubber Products Corp.	Dayton, Ohio	94696	Magnecraft Electric Co.	Chicago, Ill.			
86684	Radio Corp. of America, Electronic Comp. & Devices Div.	Harrison, N. J.	95023	George A. Philbrick Researchers, Inc.	Boston, Mass.			
87034	Marco Industries	Anaheim, Calif.	95236	Allies Products Corp.,	Dania, Fla.			
87216	Philco Corporation (Lansdale Division)	Lansdale, Pa.	95238	Continental Connector Corp.	Woodside, N. Y.			
87473	Western Fibrous Glass Products Co.	San Francisco, Calif.	95263	Leecraft Mfg. Co., Inc.	Long Island, N. Y.			
87664	Van Waters & Rogers Inc.	San Francisco, Calif.	95265	National Coil Co.	Sheridan, Wyo.			
87930	Tower Mfg. Corp.	Providence, R. I.	95275	Vitramon, Inc.	Bridgeport, Conn.			
88140	Cutler-Hammer, Inc.	Lincoln, Ill.	95348	Gordos Corp.	Bloomfield, N. J.	0000F	Malco Tool and Die	Los Angeles, Calif.
88220	Gould-National Batteries, Inc.	St. Paul, Minn.	95354	Methode Mfg. Co.	Rolling Meadows, Ill.	0000Z	Willow Leather Products Corp.	Newark, N. J.
88698	General Mills, Inc.	Buffalo, N. Y.	95566	Arnold Engineering Co.	Marengo, Ill.			
89231	Graybar Electric Co.	Oakland, Calif.	95712	Dage Electric Co., Inc.	Franklin, Ind.	000AB	ETA	England
89473	G. E. Distributing Corp.	Schenectady, N. Y.	95984	Siemon Mfg. Co.	Wayne, Ill.	000BB	Precision Instrument Components Co.	Van Nuys, Calif.
89665	United Transformer Co.	Chicago, Ill.	95987	Weckesser Co.	Chicago, Ill.	000CS	Hewlett-Packard Co., Colorado Springs	Colorado Springs, Colorado
90179	US Rubber Co., Consumer Ind. & Plastics Prod. Div.	Passaic, N. J.	96067	Huggins Laboratories	Sunnyvale, Calif.	000MM	Rubber Eng. & Development	Hayward, Calif.
90970	Bearing Engineering Co.	San Francisco, Calif.	96095	Hi-Q Div. of Aerovox Corp.	Olean, N. Y.	000NN	A "N" D Mfg. Co.	San Jose, Calif.
91146	ITT Cannon Elect. Inc., Salem Div.	Salem, Mass.	96256	Thordarson-Meissner Inc.	Mt. Carmel, Ill.	000QQ	Cooltron	Oakland, Calif.
91260	Connor Spring Mfg. Co.	San Francisco, Calif.	96296	Solar Manufacturing Co.	Los Angeles, Calif.	000WW	California Eastern Lab.	Burlington, Calif.
91345	Miller Dial & Nameplate Co.	El Monte, Calif.	96330	Carlton Screw Co.	Chicago, Ill.	000YY	S. K. Smith Co.	Los Angeles, Calif.
			96341	Microwave Associates, Inc.	Burlington, Mass.			
			96501	Excel Transformer Co.	Oakland, Calif.			

THE FOLLOWING HP VENDORS HAVE NO NUMBER ASSIGNED IN THE LATEST SUPPLEMENT TO THE FEDERAL SUPPLY CODE FOR MANUFACTURERS HANDBOOK.

SECTION VI MANUAL CHANGES

6-1. GENERAL

6-2. This section contains backdating information to adapt this manual to older 5050B instruments and 5050A recorders. Options are described in Section I, Table 1-3.

6-3. CURRENT INSTRUMENTS

6-4. This manual applies directly to Model 5050B Recorders having serial prefix 908-.

6-5. OLDER 5050B INSTRUMENTS

6-6. Backdating information to make this manual apply to older 5050B instruments is in Table 6-1.

6-7. 5050A INSTRUMENTS

6-8. Backdating information to make this manual apply to Model 5050A Recorders is in Table 6-2. Model 5050A and 5050B Digital Recorders are electrically identical. The 5050B has front panel and other mechanical changes to permit installing the Digital Clock (Option 55).

6-9. NEWER INSTRUMENTS AND SPECIAL INSTRUMENTS

6-10. As changes are made, newer instruments may have serial numbers not listed in this manual. Manuals for these instruments will be supplied with an additional "Manual Changes" sheet containing the required information. Manuals for instruments having electrical or mechanical modifications affecting instrument operation will include a special insert describing the modification. If an information sheet is missing, contact nearest Hewlett-Packard Sales and Service Office (listed at back of this manual). Include complete instrument model or specification number and serial number when requesting information.

Table 6-1. 5050B Manual Changes

Serial Prefix No.	Make Manual Changes
836	6

Table 6-2. 5050A Manual Changes

Serial Prefix No.	Make Manual Changes
720	1, 2, 3, 4, 5
740	2, 3, 4, 5
744	3, 4, 5
752	4, 5
828	5

CHANGE 1: Note: Some instruments in this group may have assemblies identified "SERIES 728".

A4C11 was 240 pF, HP Part No. 0140-0199.
A5-A14CR14 and CR35 were HP Part No. 1901-0096.
A5-A14R15 and R45 were HP Part No. 0684-4741.
Chassis part R16 was 68K ohms, HP Part No. 0684-6831.

CHANGE 2: A3 Print Command Board Assembly (05050-6005) was Series 652. This series did not include 50 μ sec Inhibit Off Extension circuits that are on current boards. Current board (Series 744) may be used as direct replacement for Series 652 board.

Delete A3CR19-24, A3Q9, 10, A3R63-70.
A3C11 was 1.0 μ F, HP Part No. 0160-0859.
A3C13 was 200 μ F, HP Part No. 0180-0144.

CHANGE 2 (Cont'd) A3Q1, 2, 6, 7 were 2N388A, HP Part No. 1851-0024.
 A3Q3-5 were HP Part No. 1850-0062.
 A3Q8 was 2N3125, HP Part No. 1850-0405.

Terminal board assembly shipped with these instruments may be identified as HP Part No. 05050-6014. For replacement, order 05050-2058.

Delete Spacer, HP Part No. 05050-2066.
A16 Power Supply Board Assembly (05050-6003) was Series 720. Current board (Series 744) is direct replacement.

CHANGE 3: These instruments did not include A15MP98, Cover-Ink Roll, HP Part No. 05050-6031. This part may be used with the Mechanism Assemblies in these instruments to reduce ink splatter in mechanism compartment.

A1J1 and A1J2 (STANDARD)

Both rear-panel input connectors were on the same printed circuit assembly (A1, Input Board Assembly, HP Part No. 05050-6006). Reference voltage clamp circuits for these connectors were also on this assembly. Reference designators for these components were retained when assembly was split in half to allow introduction of Options 50 and 51.

Delete following part numbers relating to A1:
05050-2060, -2061, -6018, -6019.

A4 Timing Board Assembly (05050-6004) was Series 720.
A4C10 was 0.39 μ F, Hp Part No. 1980-1772.
A4R52 was 56K ohms, HP Part No. 0683-5635.
Delete A18, Board: Connector, HP Part No. 05050-6025.
T1 was HP Part No. 9100-1720.

CHANGE 4: A3 Print command Board Assembly, HP Part No. 05050-6017 (Option 50 or 51 only).

A3R84 was 27K ohms, HP Part No. 0683-2735.
A3R92 was 33K ohms, HP Part No. 0683-3335.
Current values listed are preferred replacement.
A4 Timing Board Assembly (05050-6004) was Series 744.

Replace A4 Timing Board Assembly schematic (Figure 7-8) with Figure 6-1.

Delete A4C30, 31, A4CR36, 37, A4Q23, A4R100-102.
A4Q1-4, 6, 8, 17-22 were HP Part No. 1850-0062.
A4Q5 was HP Part No. 1851-0024.
A4Q7 was HP Part No. 1851-0017.
A15MP16 was 2300-0004.

CHANGE 5: Table 5-1: Delete the following items:

05050-0039	Chassis: P. S.
05050-0040	Holder: Paper
05050-0041	Panel: Mechanical
05050-0042	Panel: Switch
05050-0043	Panel: Recorder
05050-0044	Plate: Latch
05050-2067	Frame: Recorder

Add the following items:

05050-0006	Frame: Support
05050-0007	Bracket: Control Panel
05050-0008	Panel: Control
05050-0009	Panel: Mechanical
05050-0015	Plate: Latch
05050-0017	Holder: Paper
05050-0021	Chassis: P. S.
05050-0028	Spacer: Switch
05050-0029	Extension: Trim
05050-2023	Latch: Support

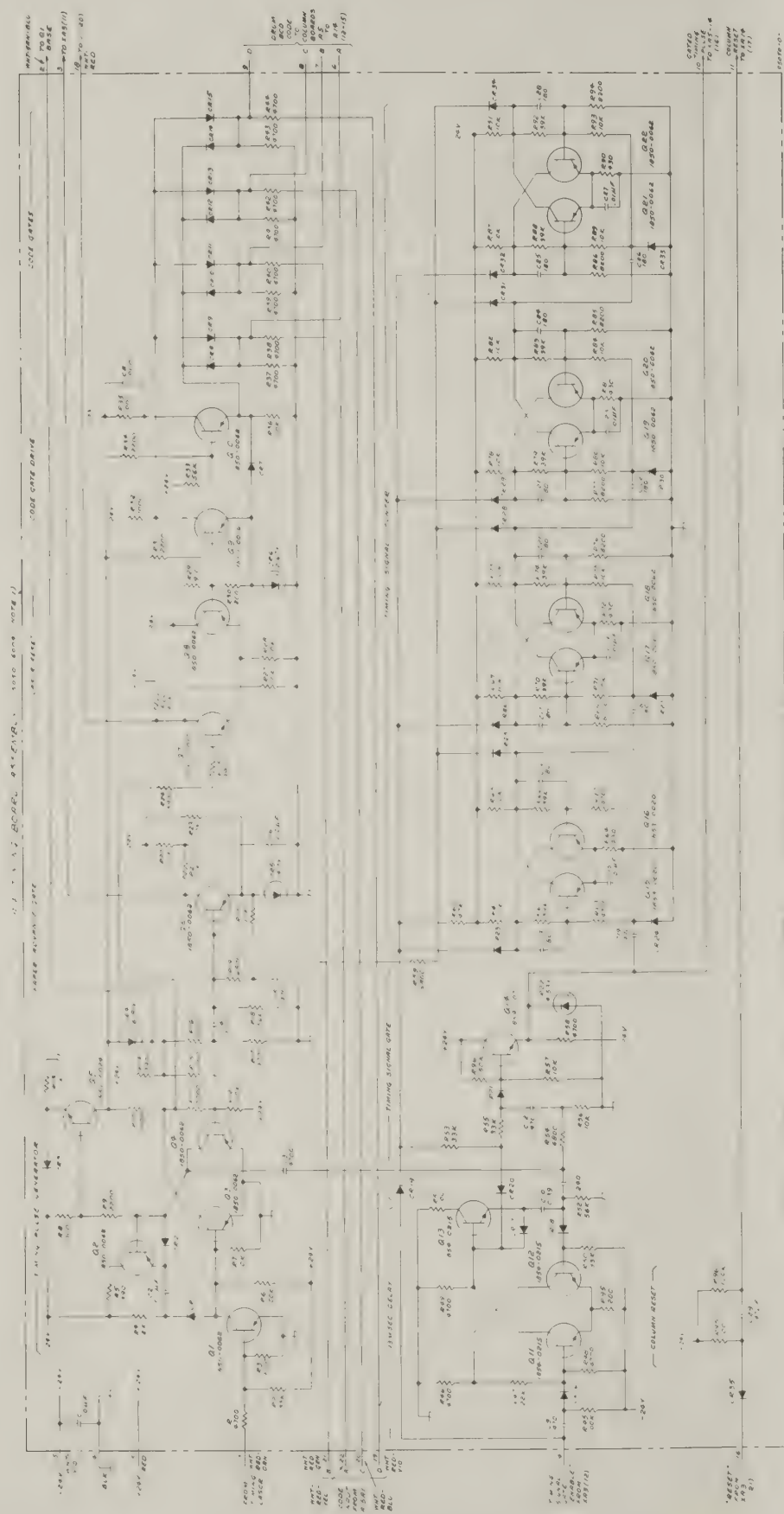
CHANGE 5: Table 5-1 (Cont'd):

05050-2036	Trim: Lower
05050-2037	Trim: Upper
05050-2038	Divider: Center
05050-2045	Frame: Lower
05050-2046	Frame: Upper

CHANGE 6: Table 5-1, change:

A19R74 from 0683-4325 to 0683-3025 R:fxd, comp, 3K ohms, 5%, 1/4W.
A19R8 from 0684-1531 to 0684-1031, R:fxd, comp, 10K ohms, 10%, 1/4W.
A24R14 from 0683-6835 to 0683-7535, R:fxd, comp, 75K ohms, 5%, 1/4W.

Figure 6-1. A4 Timing Board Assembly



SECTION VII

CIRCUIT DIAGRAMS

7-1. GENERAL

7-2. This section contains block, schematic, and pictorial diagrams of circuits and assemblies in the 5050B. Block and schematic diagrams are on fold-out pages, allowing them to be used with manual opened to any other section, or with manual closed. The figure for each assembly also contains a description of assembly functions, controls, and troubleshooting hints.

7-3. REFERENCE DESIGNATORS

7-4. The reference designation system used for identifying assemblies and components is shown in Figure 7-2. Reference Designation Index on each figure lists components shown in schematic diagram portion of that figure. Complete parts descriptions are given in Section VI of this manual.

7-5. ADDITIONAL INFORMATION

7-6. The positive end of an electrolytic capacitor, or the cathode end of a diode, is indicated by a small foil dot or triangle on the printed circuit board assembly.

Figure 7-1. Top Internal View

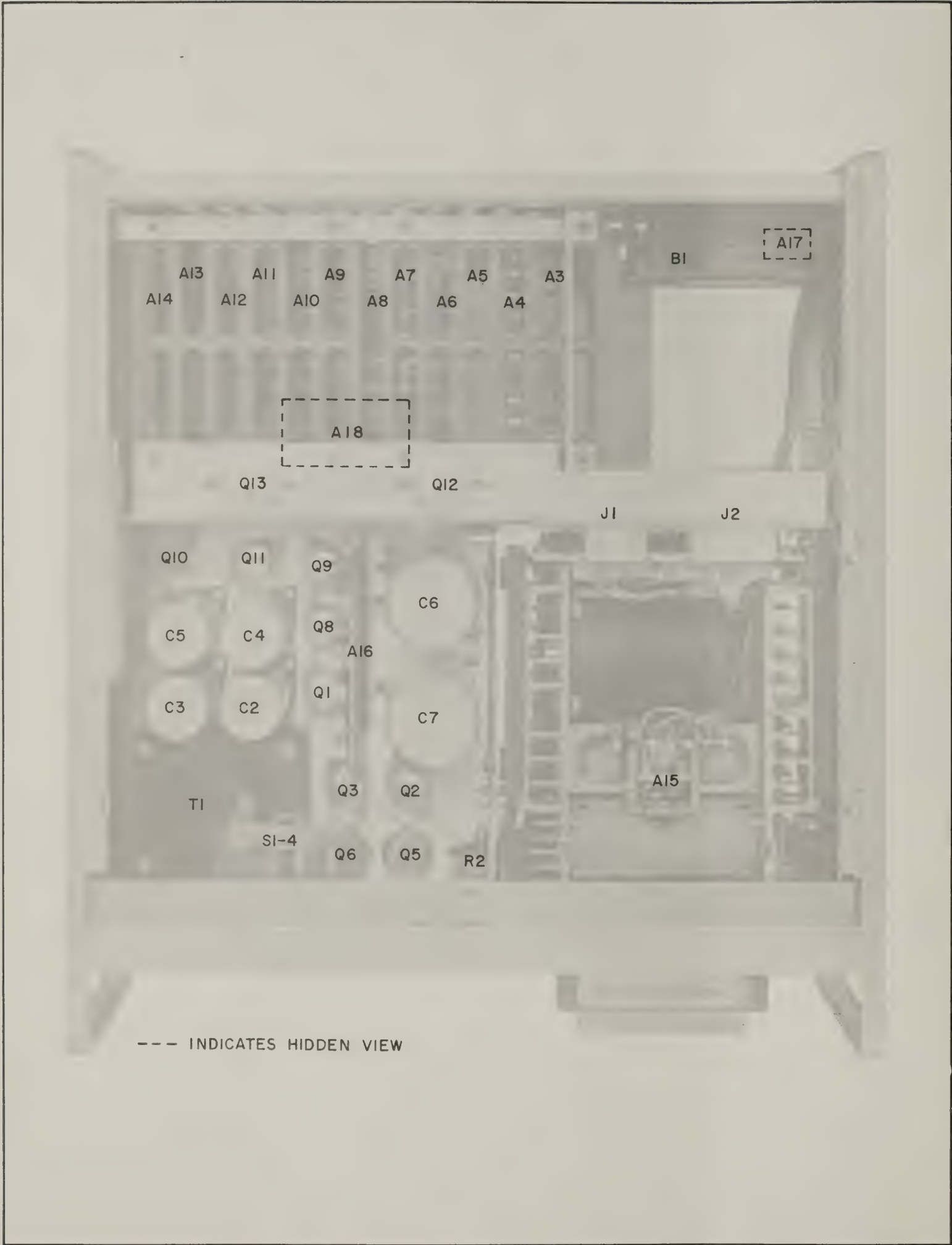
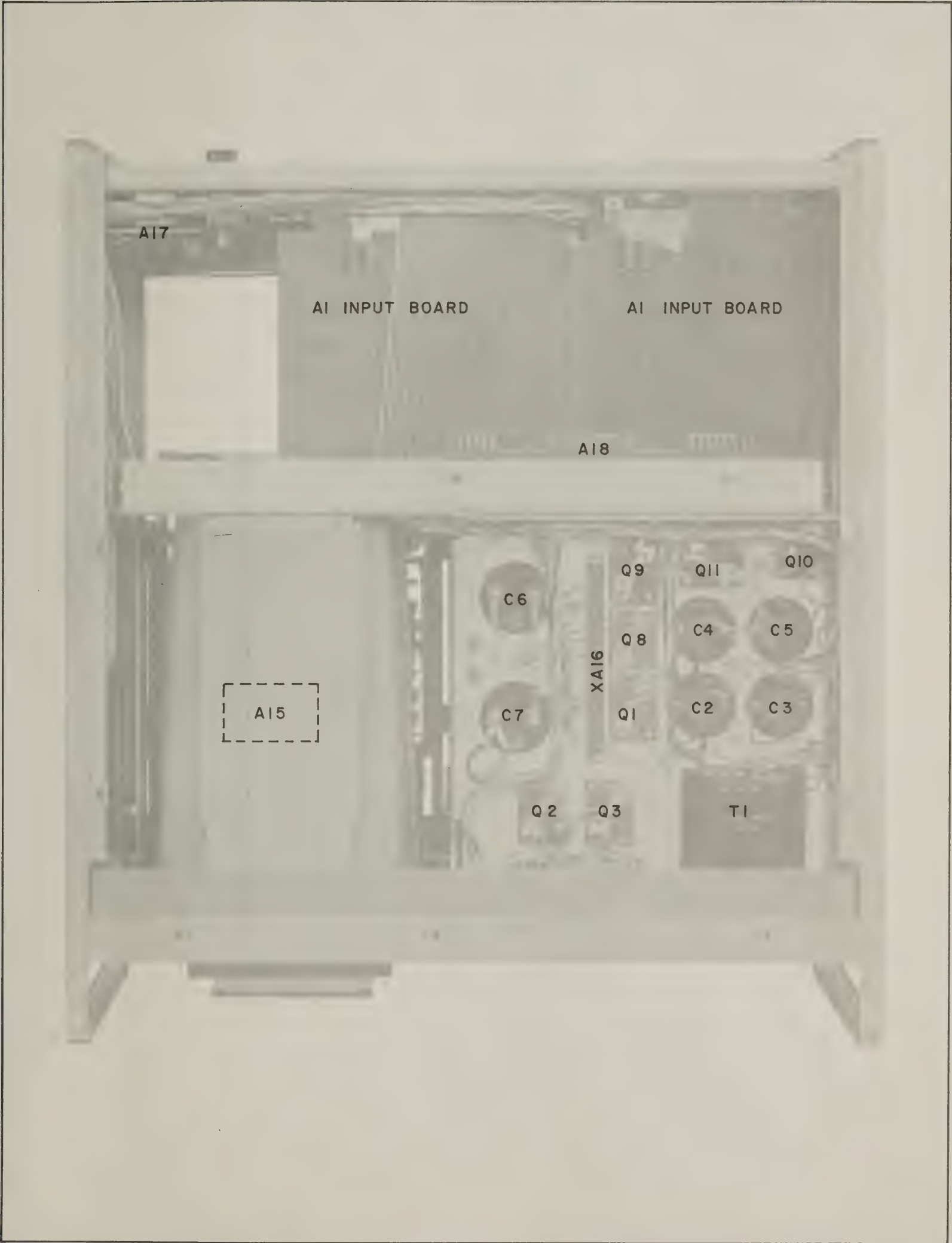


Figure 7-2. Bottom Internal View



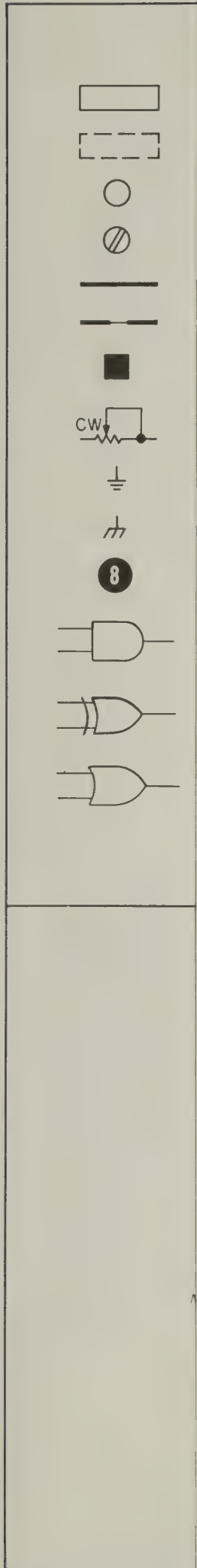
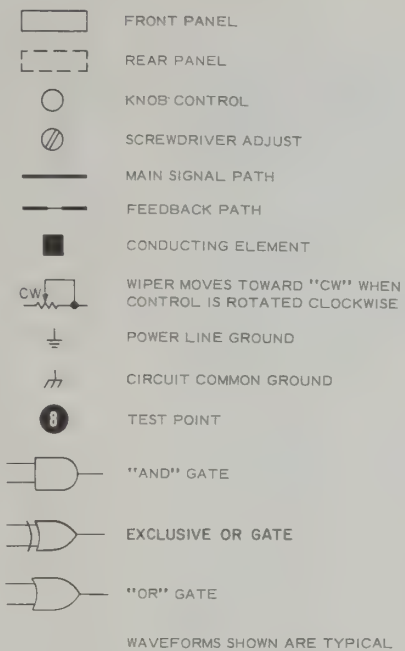
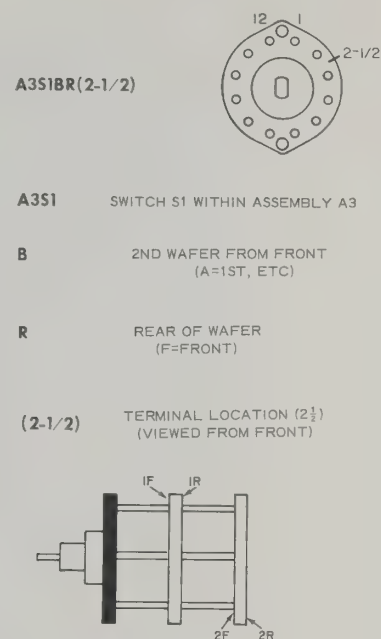


Figure 7-3. Schematic Diagram Notes

SYMBOLS



SWITCH DESIGNATIONS



REFERENCE DESIGNATIONS

REFERENCE DESIGNATIONS WITHIN ASSEMBLIES ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.

ASSEMBLY	ABBREVIATION	COMPLETE DESCRIPTION
A25	C1	A25C1
A25A1	CR1	A25A1CR1
NO PREFIX	J3	J3

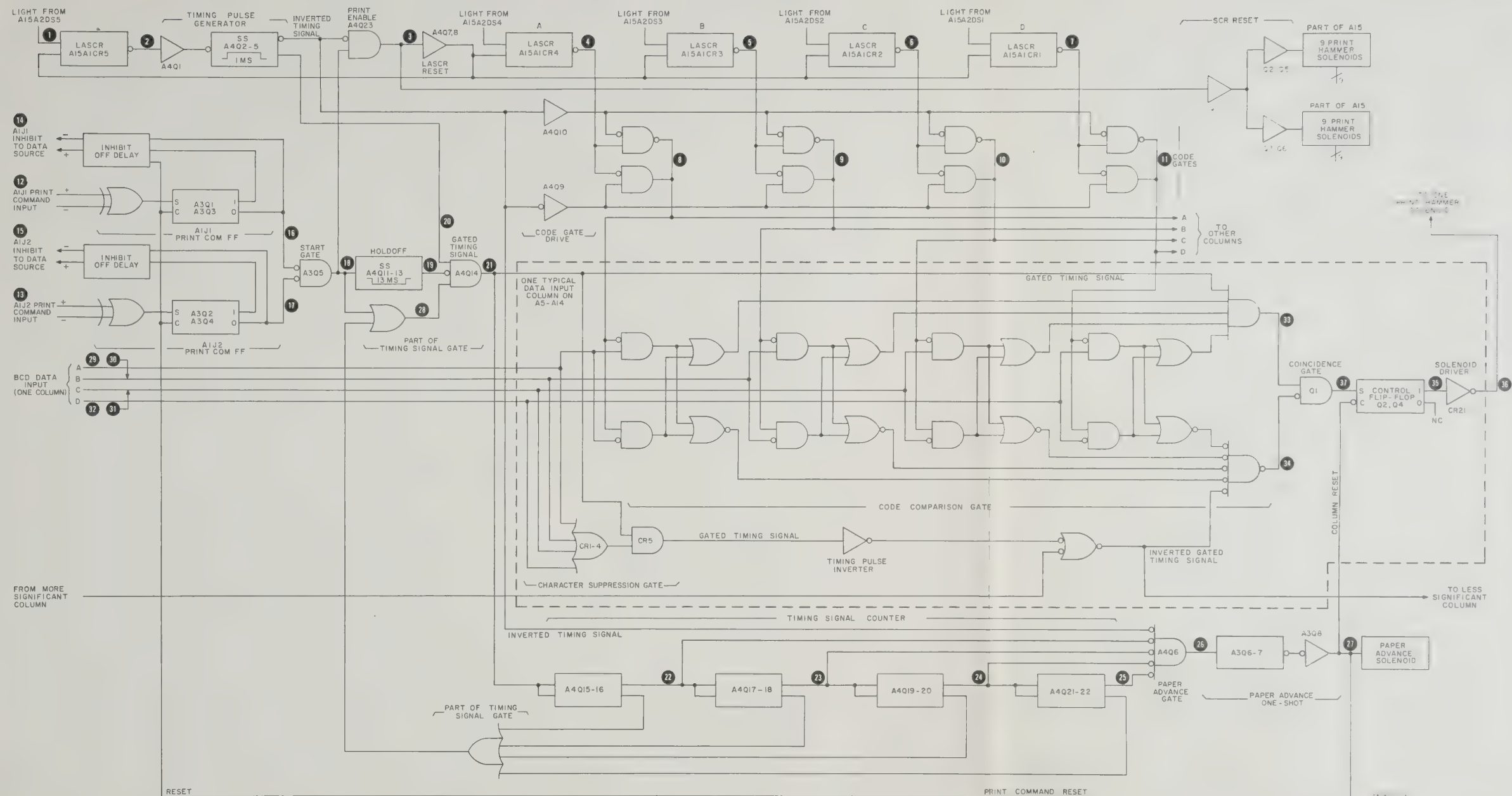
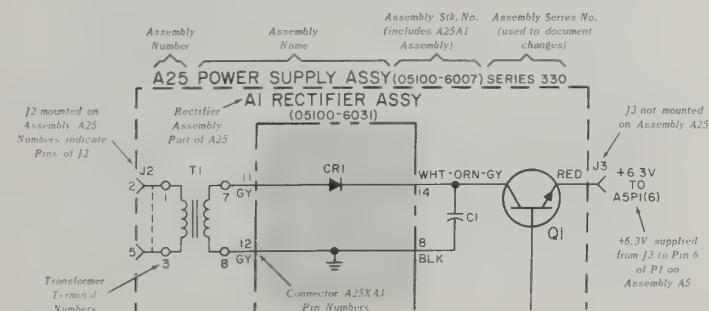
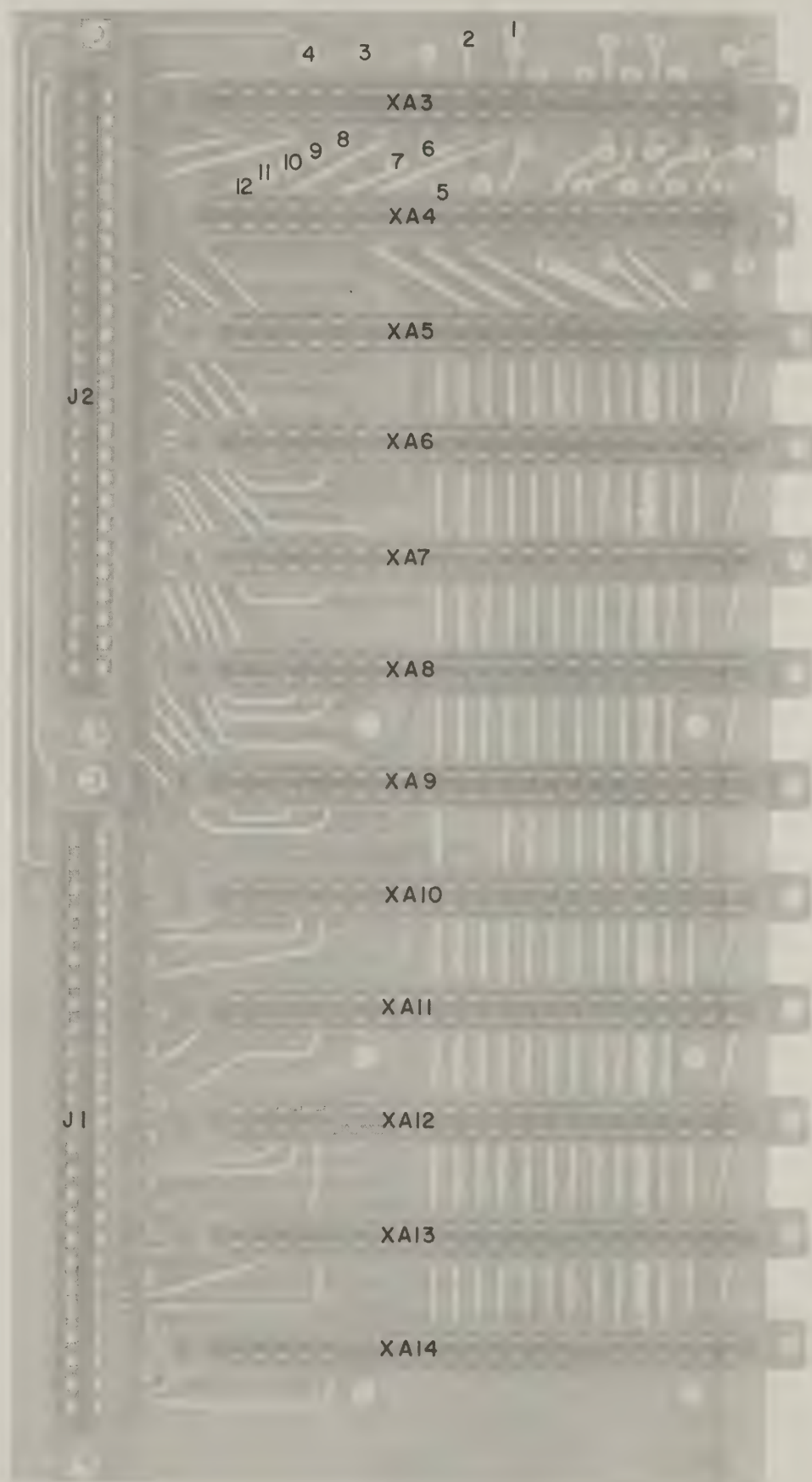
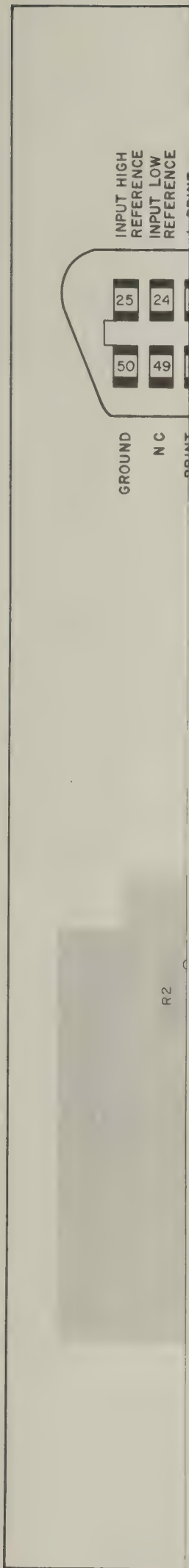
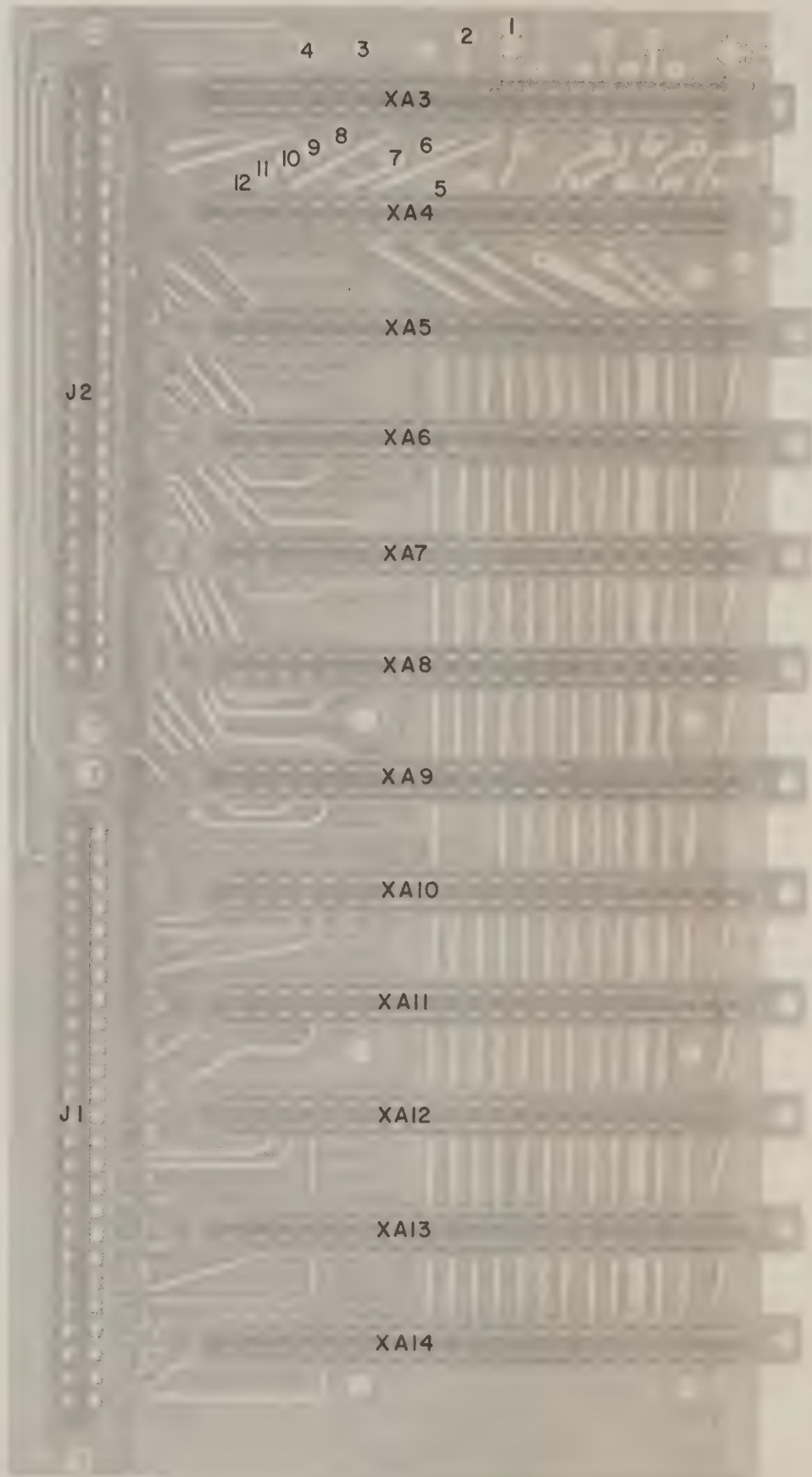


Figure 7-4. Logic Diagram







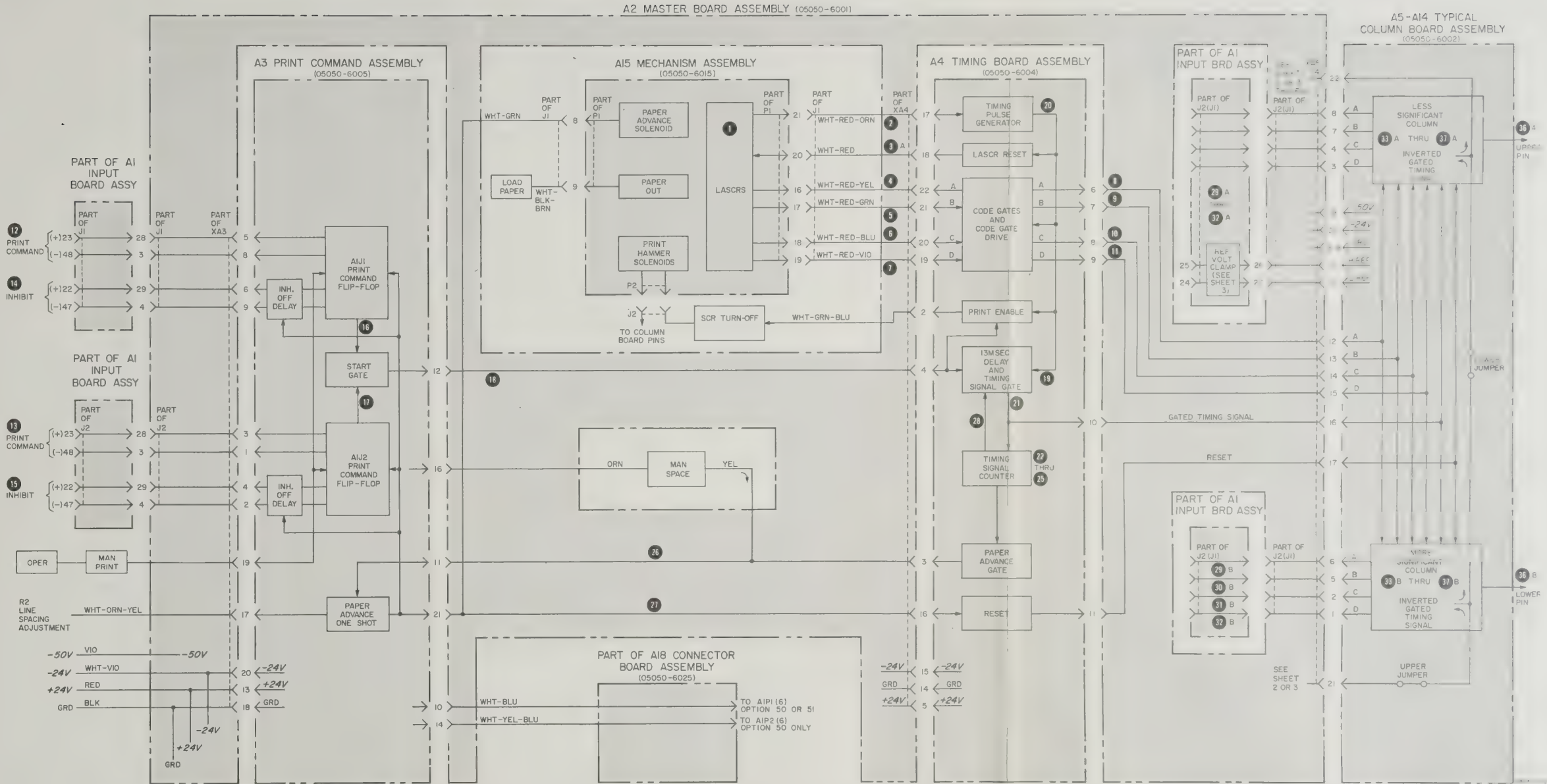
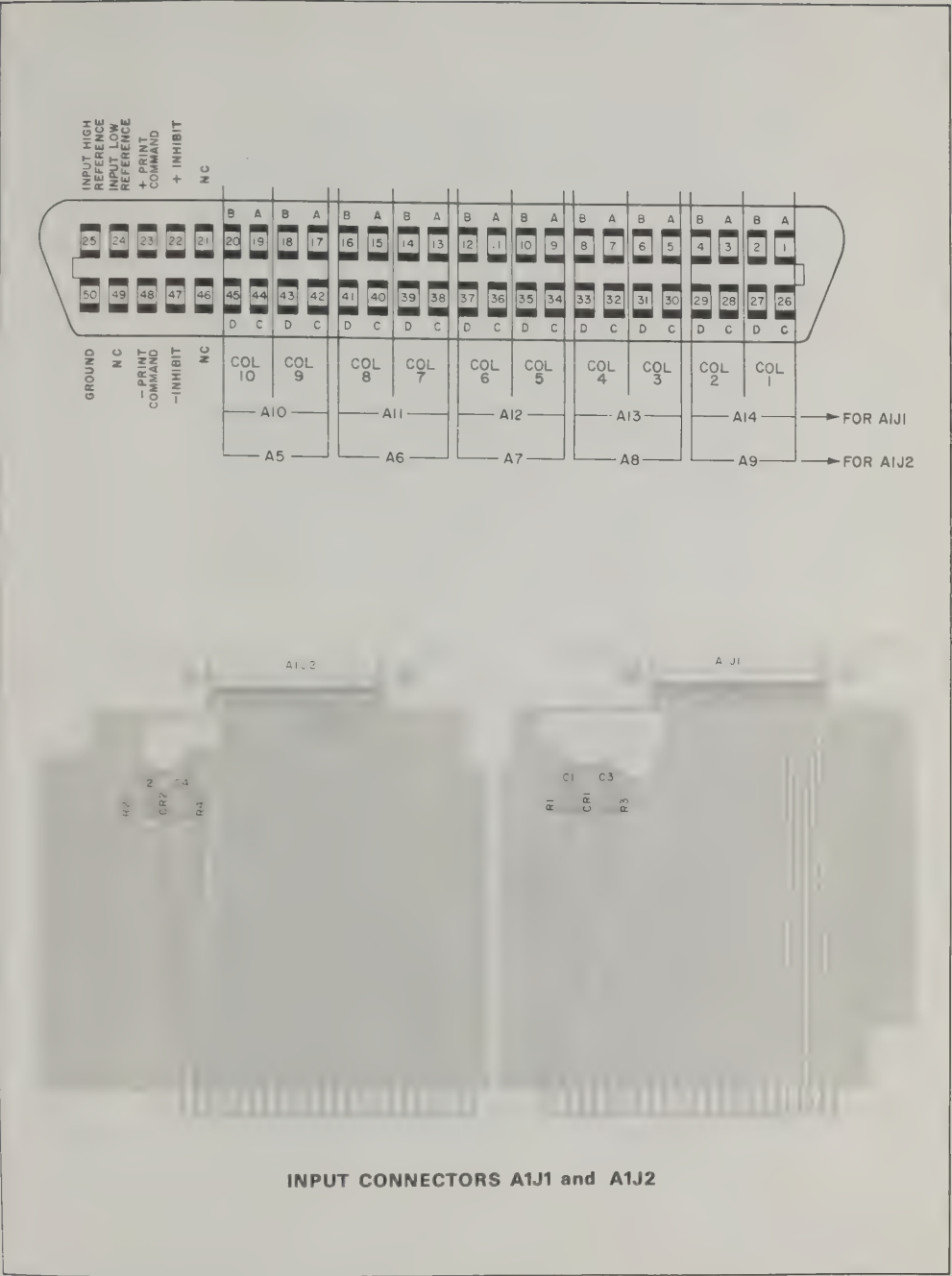
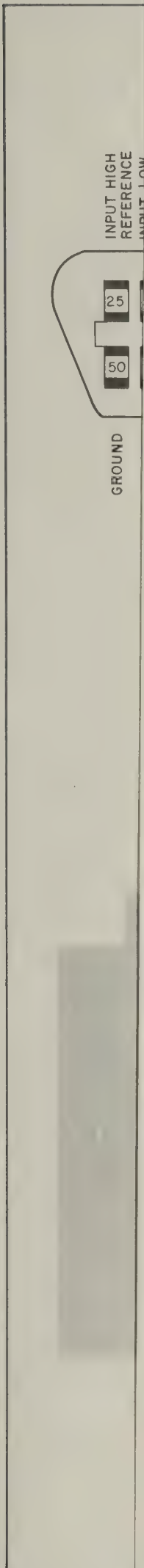
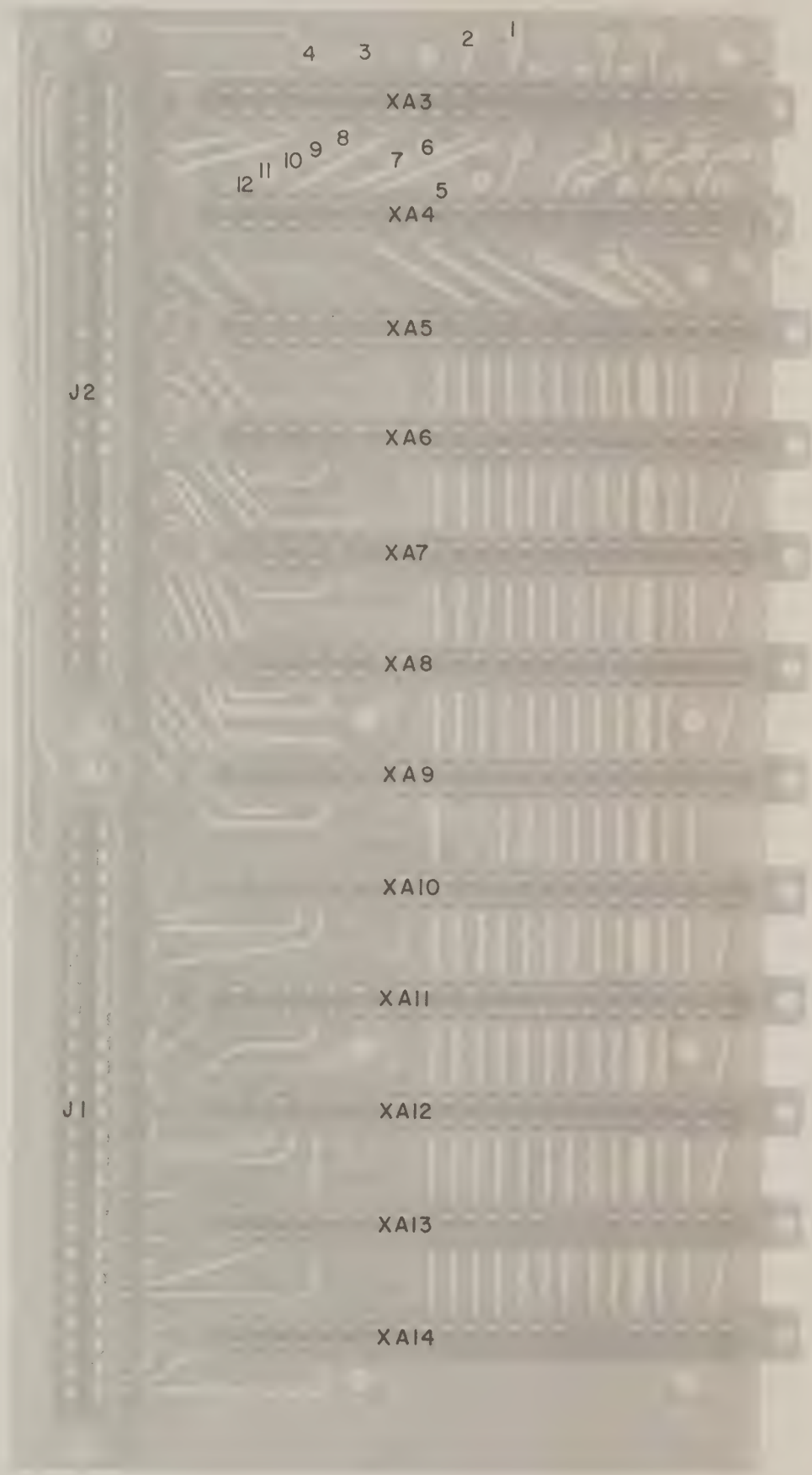
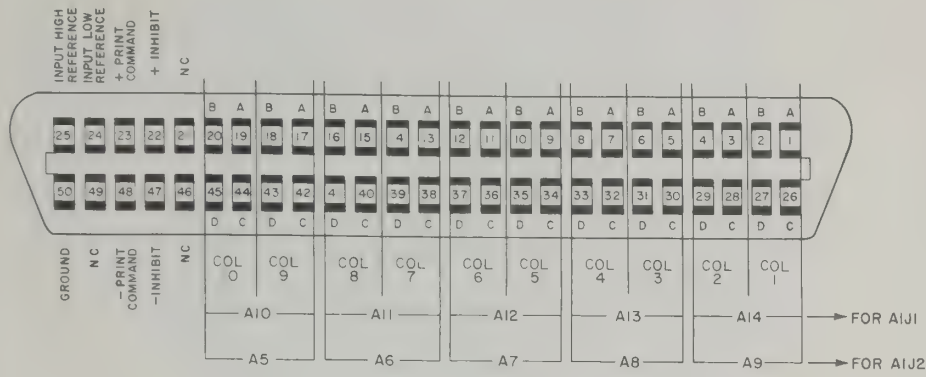


Figure 7-5. Master Board A2
(Sheet 1 of 3)









INPUT CONNECTORS A1J1 and A1J2

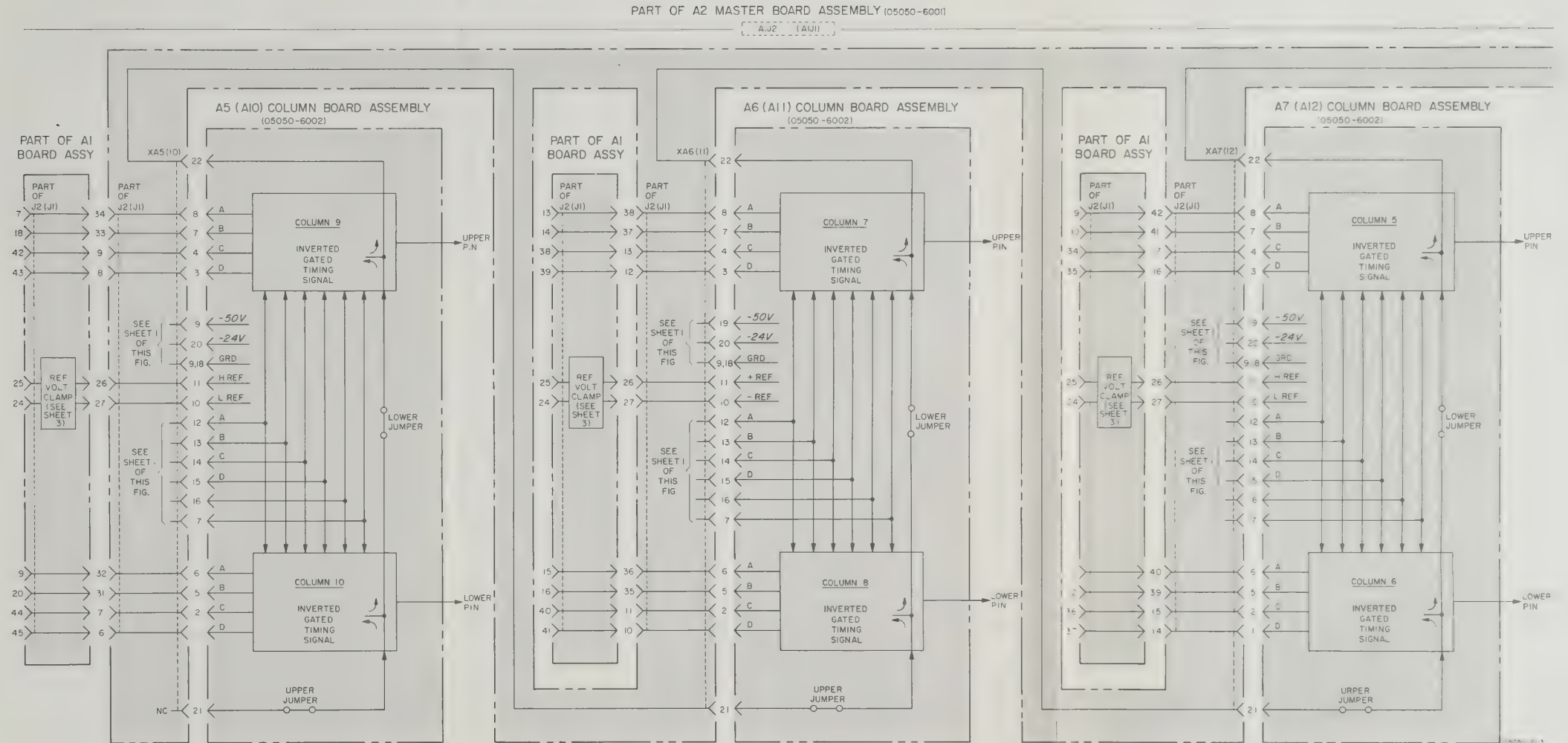
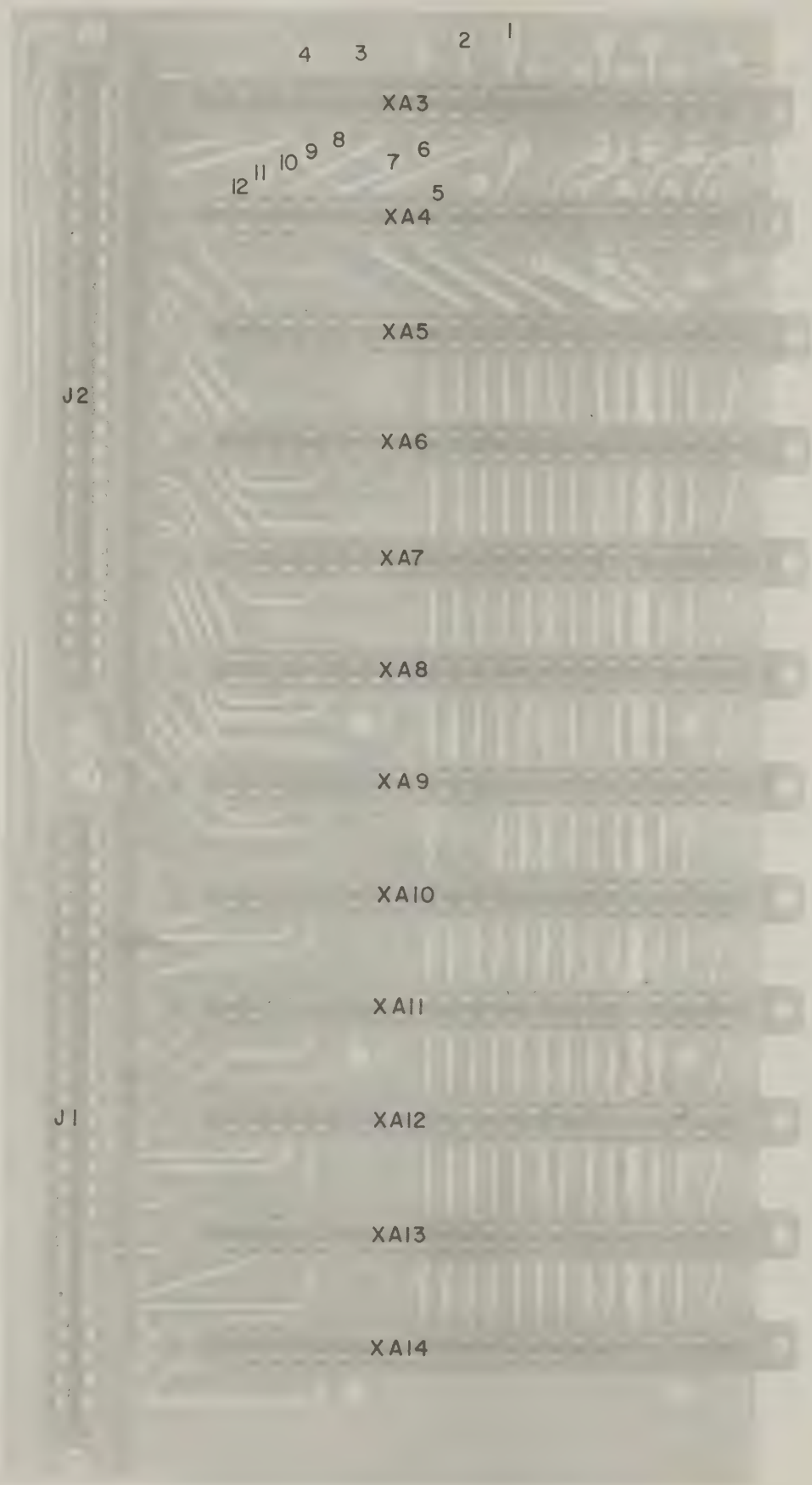
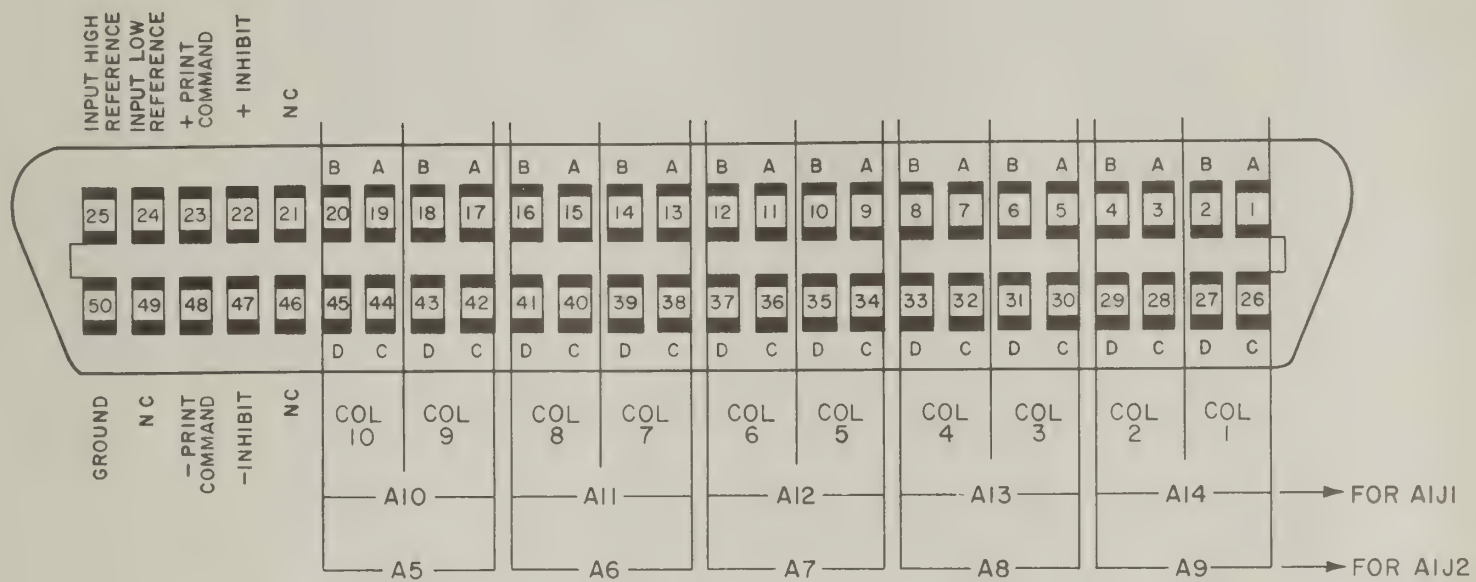
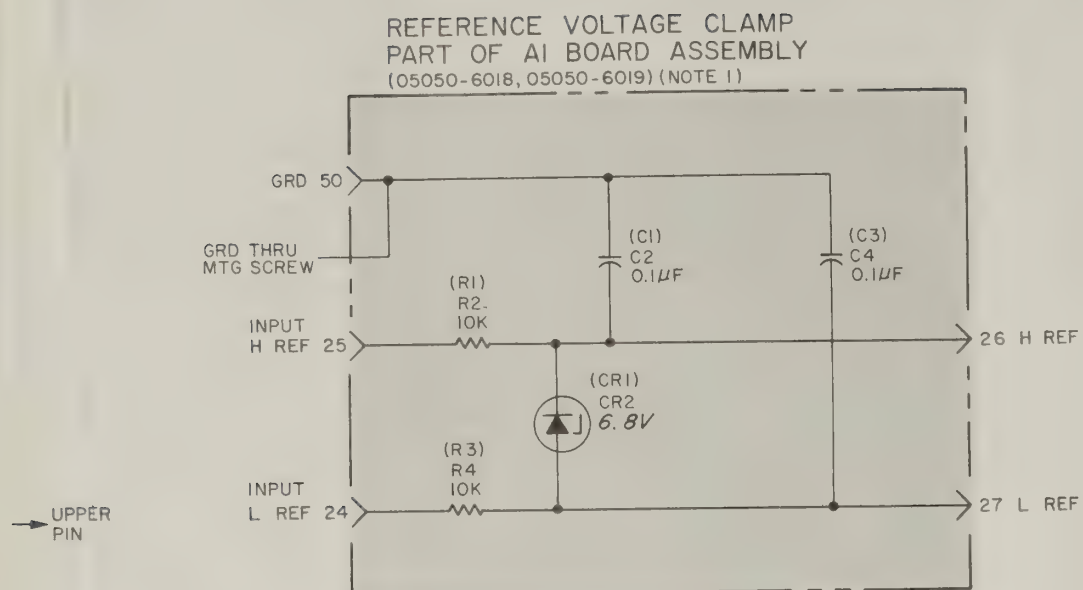


Figure 7-5. Master Board A2
(Sheet 2 of 3)





INPUT CONNECTORS A1J1 and A1J2



REFERENCE DESIGNATIONS

A1
C1-4
CR1,2
R1-4

NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
RESISTANCE IN OHMS;
CAPACITANCE IN PICO FARADS;

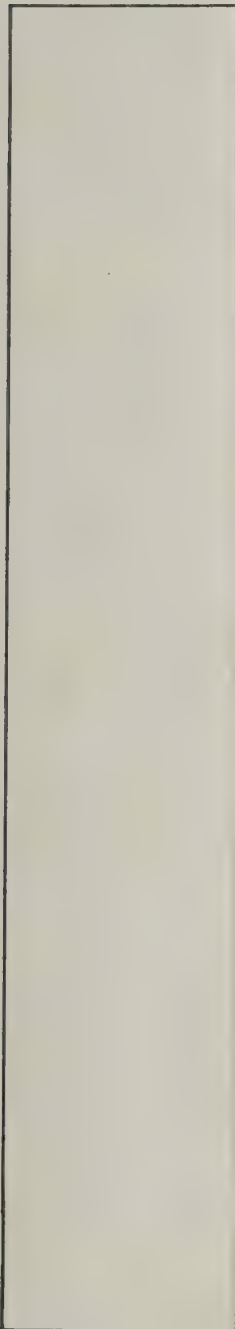
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05050-0-4A

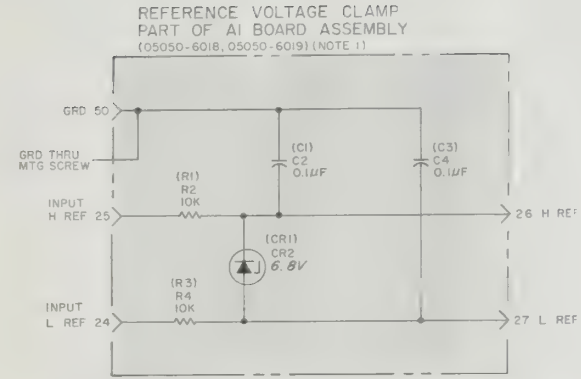
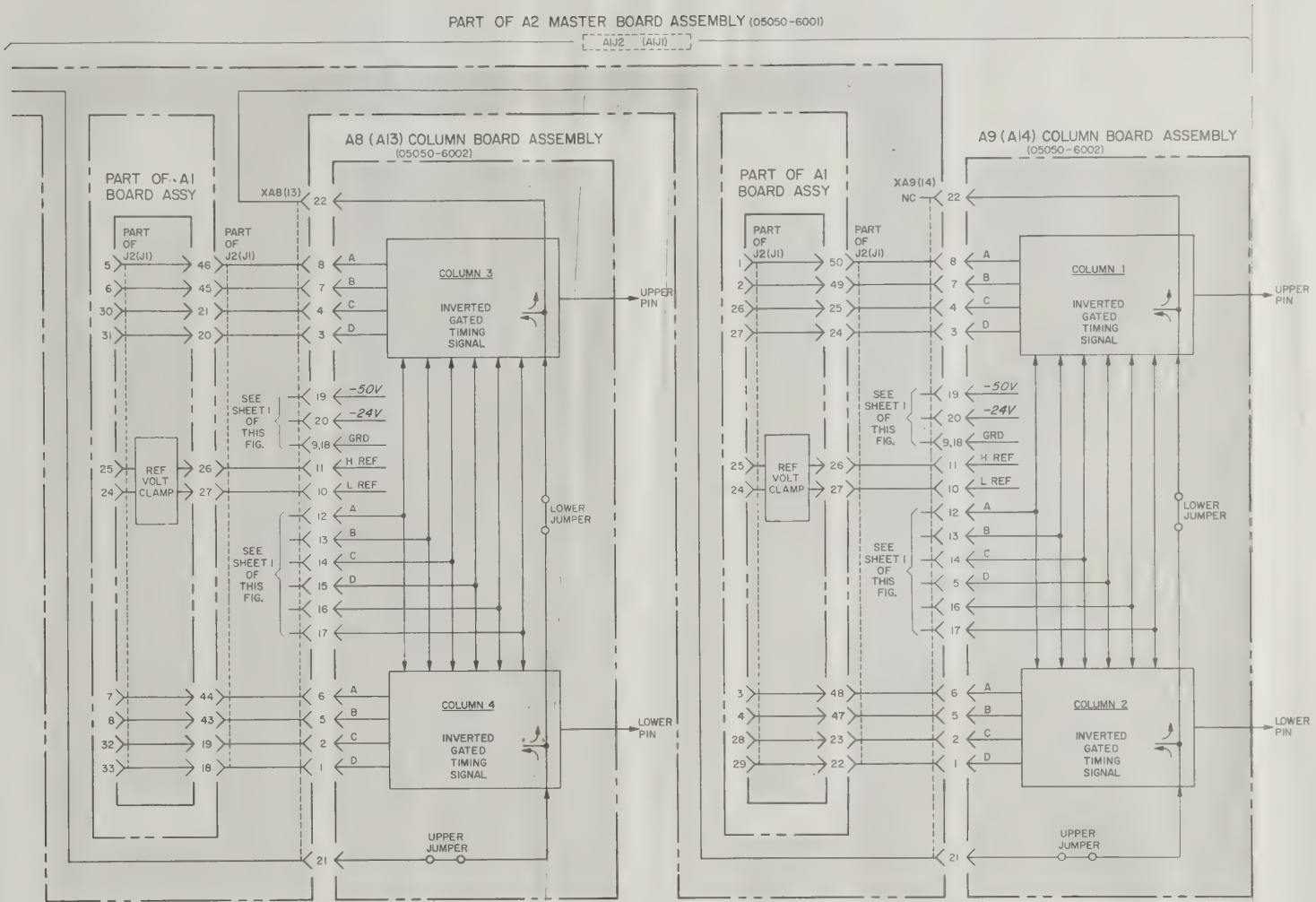
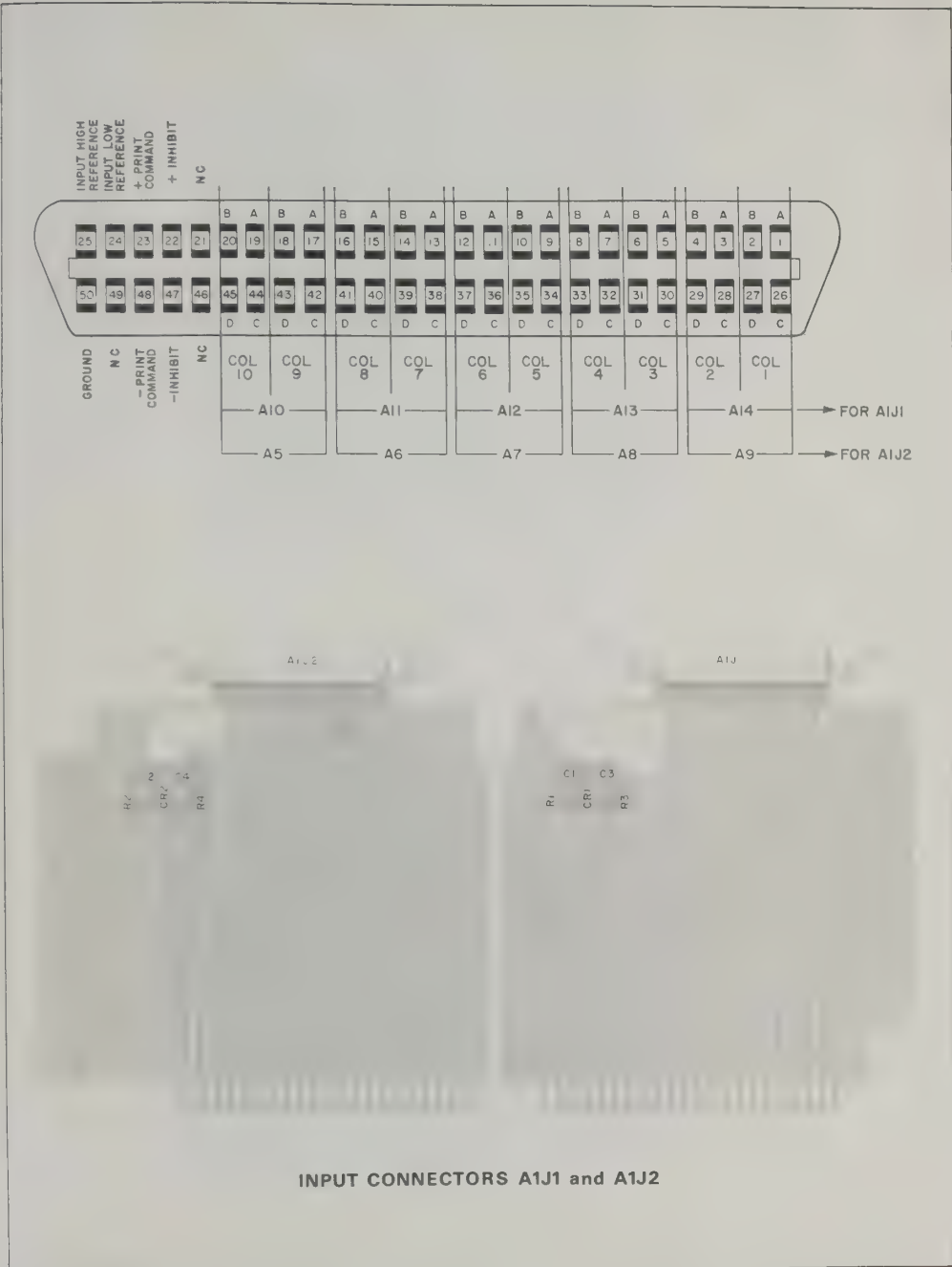
Figure 7-5. Master Board A2
(Sheet 3 of 3)

FUNCTIONS

a. Stores input
Assembly contains
circuit (buffer stage)
external source is
biased, and input
75 μ A from a common
to drive storage
must be supplied
75 μ A "low" state
gate is driven low
with integrated circuit
becomes input to

b. Provides r
Assemblies. Input
supply are floating
to input. External
grated circuit voltage
ground. When circuit
Section II), common
ative than INPUT
region about 1.5V
Diode CR41 provides





REFERENCE DESIGNATIONS

A1
C1-4
CR1,2
R1-4

NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED, RESISTANCE IN OHMS, CAPACITANCE IN PICOFARADS.

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Figure 7-5. Master Board A2
(Sheet 3 of 3)

FUNCTIONS

a. Stores input data. Each Buffer Storage Input Assembly contains a sensitive quad latching integrated circuit (buffer storage) for each input column. With external source in low state, coupling diodes are back-biased, and input current to latches is approximately 75 μ A from a constant-current source (Q3). In order to drive storage units to "high" state, enough current must be supplied by any "high" input line to overcome 75 μ A "low" state current. Data transfer occurs when gate is driven low by Q5. The stored output, along with integrated circuit supply voltages as references, becomes input to Column Board Assemblies.

b. Provides reference voltages for Column Board Assemblies. Integrated circuit common and positive supply are floating when no data source is connected to input. External reference(s) determine(s) integrated circuit voltages with respect to 5050B chassis ground. When only INPUT L REF is supplied (see Section II), common is approximately 0.4V more negative than INPUT L REF, placing center of switching region about 1.5V more positive than INPUT L REF. Diode CR41 provides the 0.4V drop while Q1 and Q2

are inactive. When both INPUT H REF and INPUT L REF are provided, voltage at test point A is voltage at wiper of R41, minus a voltage drop of approximately 1.1 V across emitter followers Q1, Q2.

CONTROLS

a. On board: Reference centering adjustment R41. (See Section II, Option 50/51 Reference voltage selection.)

b. Off board: None.

TROUBLESHOOTING

a. Make a sample tape and analyze printed output to determine location and type of malfunction.

b. Check for gate signal from A3.

c. Check input code and reference voltages.

d. Check setting of R41.

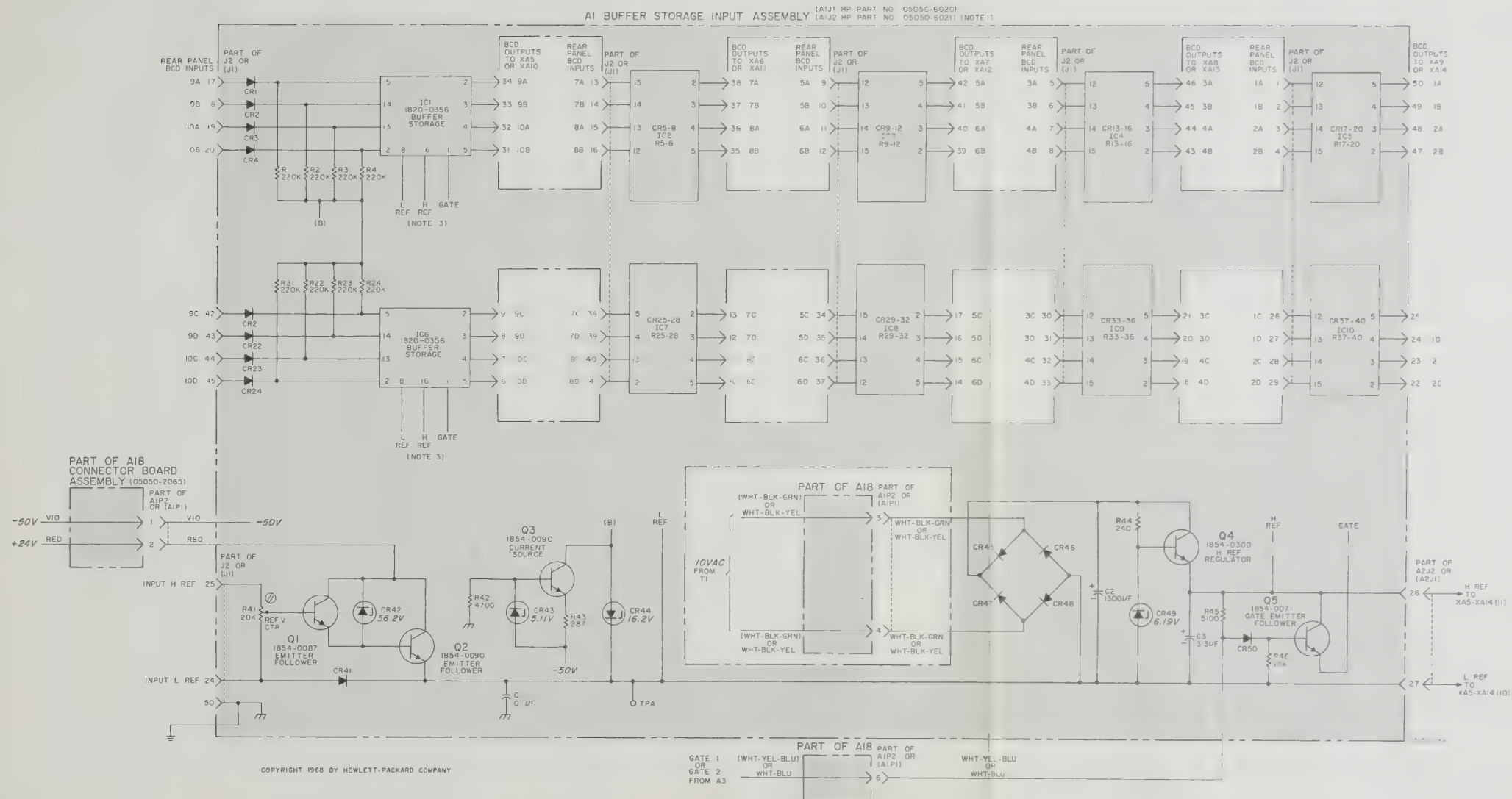
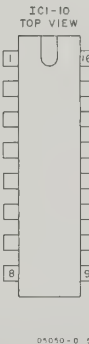
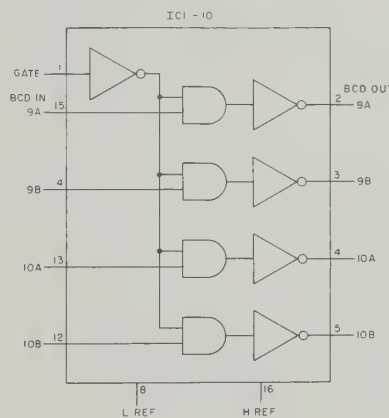
e. Check H REF Regulator.

NOTES

- REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
- UNLESS OTHERWISE INDICATED:
RESISTANCE IN OHMS,
CAPACITANCE IN PICOFARADS.
- SAME CONNECTIONS APPEAR ON IC1-5 AND IC6-10.

REFERENCE DESIGNATIONS

A
C 3
CR 50
IC 10
10 1, 2
(R) 2
Q1-5
R 46
TPA

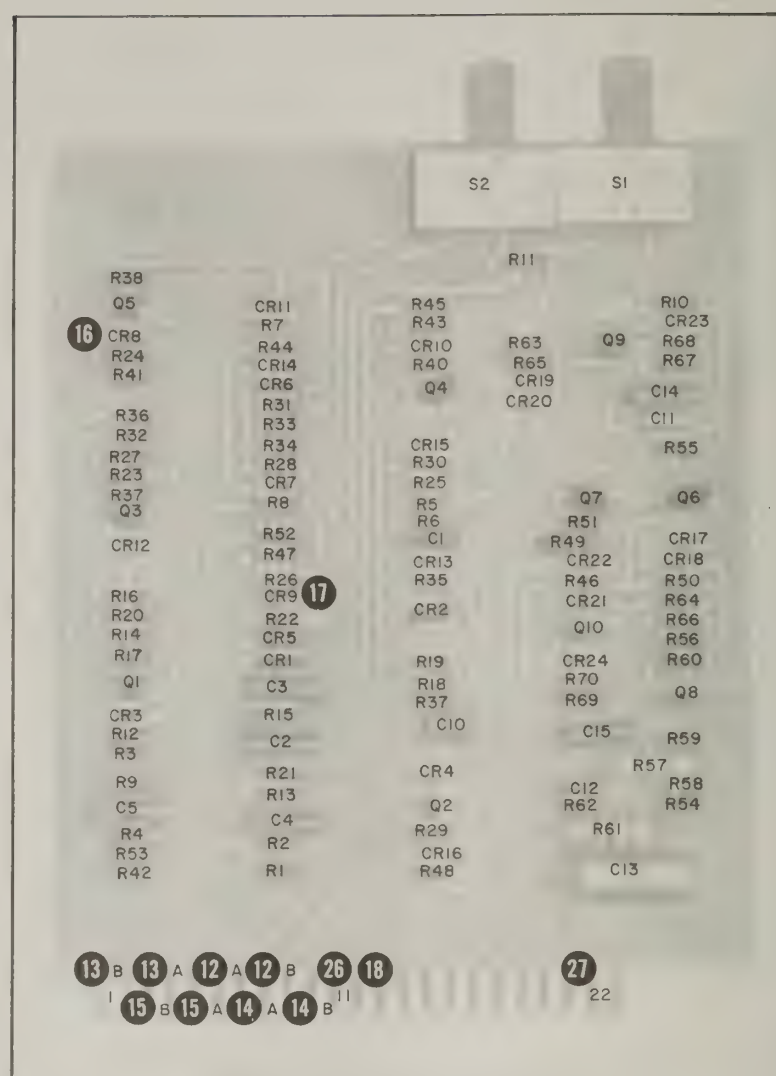
Figure 7-6. Input Board A1
Option 50/51

FUNCTIONS

a. Begins print cycles. Print commands cause the print command flip-flops to change state, generating inhibit signals to data sources and input signals to start gate. When both start gate inputs are low, start output goes high, beginning print cycle.

b. Ends print cycles. Approximately 50 msec after start gate output goes high, input signal at A3(11) goes high, indicating that all possible printing has occurred, and paper should be advanced. The following events occur on A3 at end of print cycle:

- 1) Paper advance one-shot output goes high for a period determined by setting of paper spacing control R2.
- 2) Print command flip-flops are reset, to await new input print commands, thus closing start gate.
- 3) Inhibit off extension circuits are activated, maintaining inhibit signals to data sources for approximately 150 μ sec after print command flip-flops are reset (allowing flip-flops to stabilize before print commands can be generated).
- 4) The inductive kick at end of paper advance pulse is filtered out on A4 to reset column board assembly control flip-flops (see Figures 7-8 and 7-9).



CONTROLS

a. On Board: Print command selection switches, S1 and S2. With switch in upper position, input print command is required to place print command flip-flop in its "set" state. When switch is in its lower position, flip-flop is held in its "set" state (print command is not required). With both switches in lower position, print command flip-flops will not necessarily be in "set" state.

b. Off board:

- 1) OPER. Both print command flip-flops are held in their "reset" state when -24V is applied at A3(19), preventing print commands from setting either flip-flop. Depressing OPER opens -24V circuit to A3(19), enabling printing on command as determined by setting of print command selection switches on board.
- 2) MAN PRINT. When depressed, opens -24V circuit to A3(19) and provides one positive print command to both print command flip-flops, starting a single print cycle. Data sources are inhibited during print cycle. As long as button is depressed, -24V circuit to A3(19) is open, and 5050B will print on command (as if OPER were depressed); however only one print command is generated by MAN PRINT each time it is depressed.
- 3) MAN SPACE. When depressed, generates a positive pulse at A3(11) to trigger paper ad-

vance one-shot to advance paper one space without printing. Paper advances only one space each time pushbutton is depressed.

- 4) Paper spacing control R2. Determines distance paper advances (at end of print cycle or when MAN SPACE is depressed) by determining time constant of paper advance one-shot.

TROUBLESHOOTING

a. Operate 5050B with A3 mounted on 05050-6024 Extender Assembly (part of Service Kit, HP Part No. 05050-6023).

b. Check for paper advance one-shot output at A3(21) when MAN SPACE pushbutton is pressed.

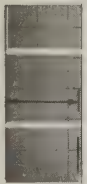
c. Check for start gate and paper advance one-shot outputs when MAN PRINT pushbutton is pressed.

d. Check for print command flip-flop outputs (inhibit signals) when MAN PRINT pushbutton is pressed.

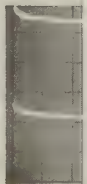
e. Check for 150 μ sec inhibit extension at end of print cycle.

f. Check effects of print command select switch settings.

-24



+ PC fr
+INHII
H: 20
Sync:



27 M
N
V
F
S

Figure 7-7

PRINT COMMAND BOARD A3
(STANDARD)

FUNCTIONS

a. Begins print cycles. Print commands cause the print command flip-flops to change state, generating inhibit signals to data sources and input signals to start gate. When both start gate inputs are low, start output goes high, beginning print cycle.

b. Ends print cycles. Approximately 50 msec after start gate output goes high, input signal at A3(11) goes high, indicating that all possible printing has occurred, and paper should be advanced. The following events occur on A3 at end of print cycle:

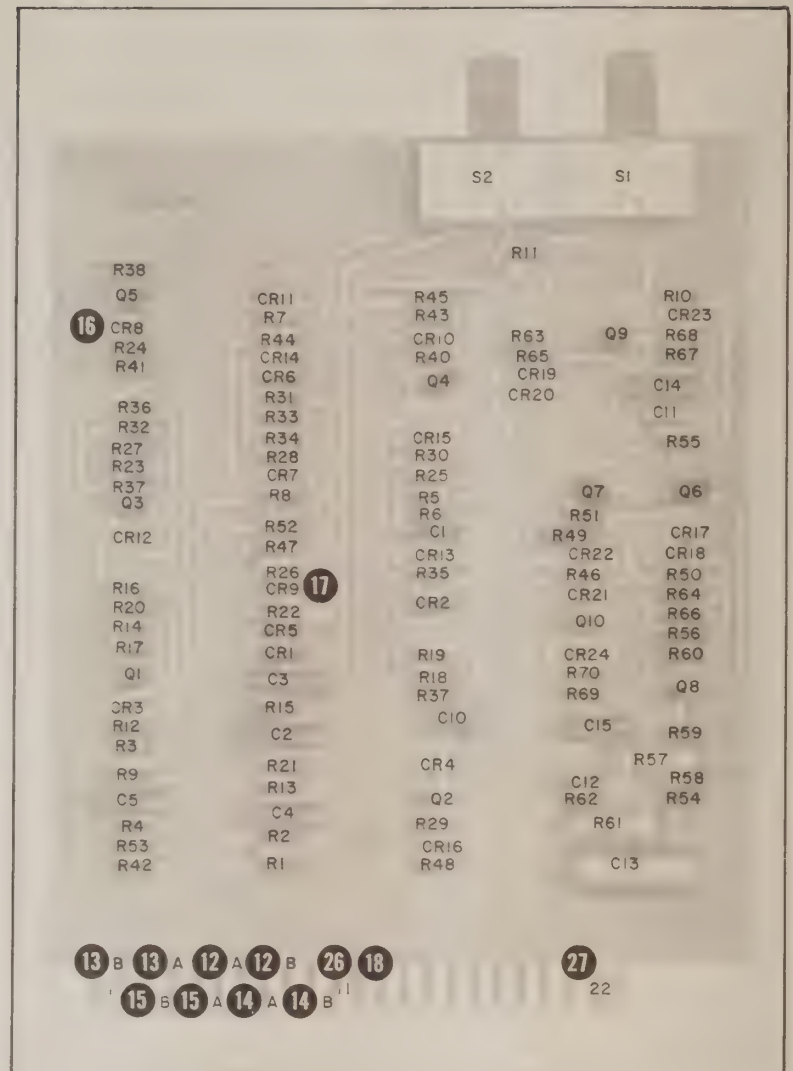
- 1) Paper advance one-shot output goes high for a period determined by setting of paper spacing control R2.
- 2) Print command flip-flops are reset, to await new input print commands, thus closing start gate.
- 3) Inhibit off extension circuits are activated, maintaining inhibit signals to data sources for approximately 150 μ sec after print command flip-flops are reset (allowing flip-flops to stabilize before print commands can be generated).
- 4) The inductive kick at end of paper advance pulse is filtered out on A4 to reset column board assembly control flip-flops (see Figures 7-8 and 7-9).

CONTROLS

a. On Board: Print command selection switches, S1 and S2. With switch in upper position, input print command is required to place print command flip-flop in its "set" state. When switch is in its lower position, flip-flop is held in its "set" state (print command is not required). With both switches in lower position, print command flip-flops will not necessarily be in "set" state.

b. Off board:

- 1) OPER. Both print command flip-flops are held in their "reset" state when -24V is applied at A3(19), preventing print commands from setting either flip-flop. Depressing OPER opens -24V circuit to A3(19), enabling printing on command as determined by setting of print command selection switches on board.
- 2) MAN PRINT. When depressed, opens -24V circuit to A3(19) and provides one positive print command to both print command flip-flops, starting a single print cycle. Data sources are inhibited during print cycle. As long as button is depressed, -24V circuit to A3(19) is open, and 5050B will print on command (as if OPER were depressed); however only one print command is generated by MAN PRINT each time it is depressed.
- 3) MAN SPACE. When depressed, generates a positive pulse at A3(11) to trigger paper ad-

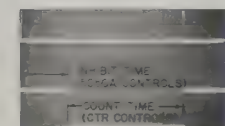
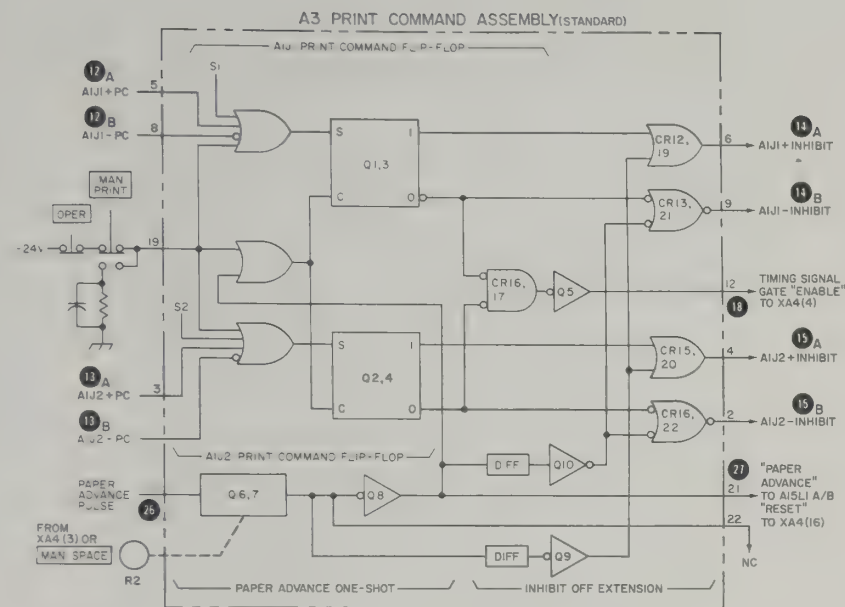


vance one-shot to advance paper one space without printing. Paper advances only one space each time pushbutton is depressed.

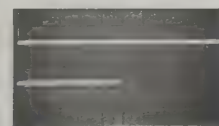
- 4) Paper spacing control R2. Determines distance paper advances (at end of print cycle or when MAN SPACE is depressed) by determining time constant of paper advance one-shot.

TROUBLESHOOTING

- a. Operate 5050B with A3 mounted on 05050-6024 Extender Assembly (part of Service Kit, HP Part No. 05050-6023).
- b. Check for paper advance one-shot output at A3(21) when MAN SPACE pushbutton is pressed.
- c. Check for start gate and paper advance one-shot outputs when MAN PRINT pushbutton is pressed.
- d. Check for print command flip-flop outputs (inhibit signals) when MAN PRINT pushbutton is pressed.
- e. Check for 150 μ sec inhibit extension at end of print cycle.
- f. Check effects of print command select switch settings.



+PC from 5240A, 5V/cm
+INHIBIT output, 5V/cm
H: 20 msec/cm
Sync: EXT AC to PC input



+PC from 5240A, 5V/cm
18 10V/cm
H: 10 msec/cm
Sync: EXT AC to PC input (18)



+INHIBIT output, 5V/cm
(21) 20V/cm
H: 10 msec/cm
Sync: +EXT AC at (18)



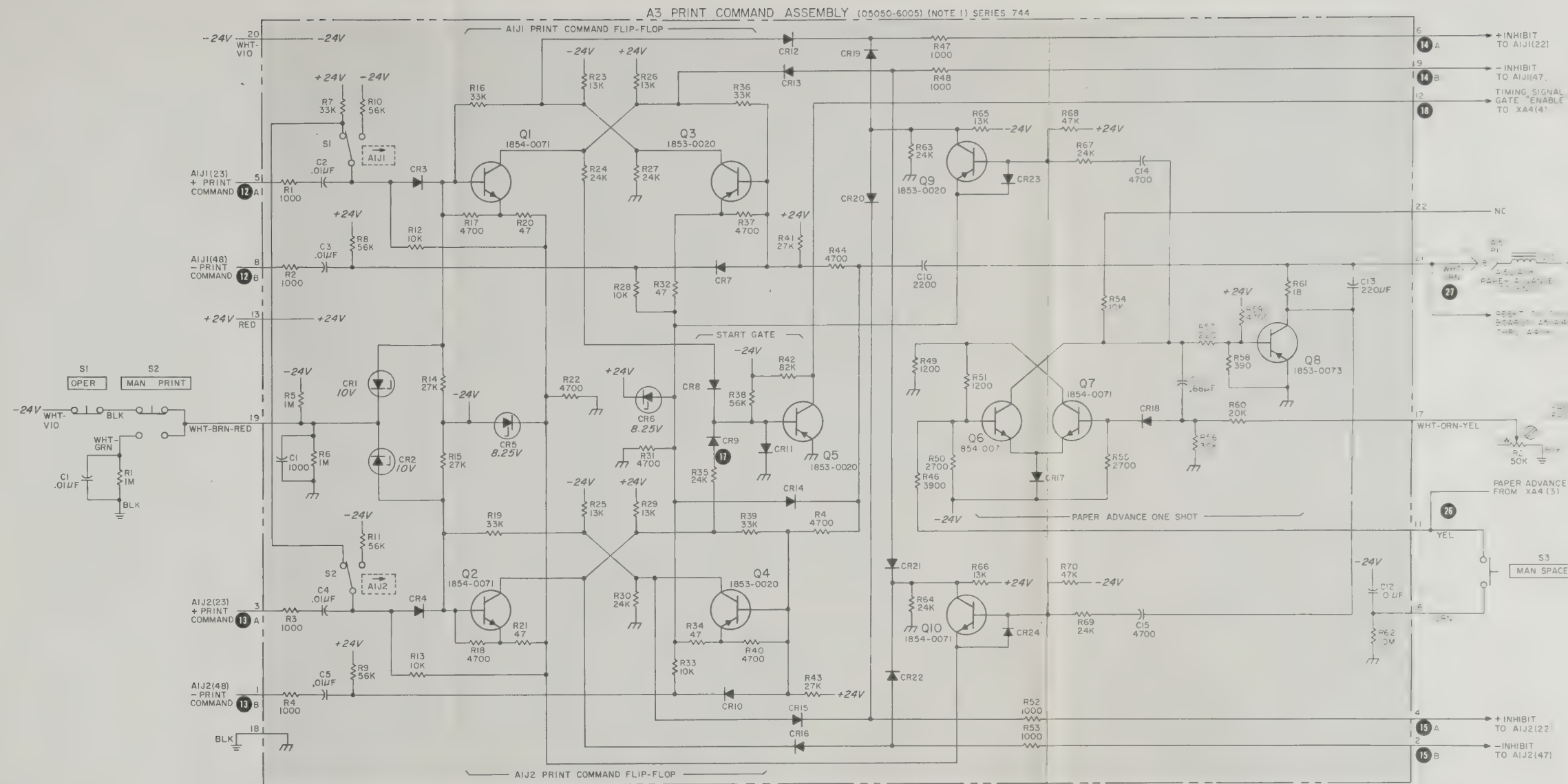
(21) Min spacing
Max spacing
V: 20V/cm
H: 2 msec/cm
Sync: +INT



+PC from 5240A
(26) 0.5V/cm (ac coupled)
H: 10 msec/cm
Sync: +EXT AC at (18)



INHIBIT output
(150 μsec extension)
V: 5V/cm
H: 50 msec/cm
Sync: -EXT AC at (18)



NOTES

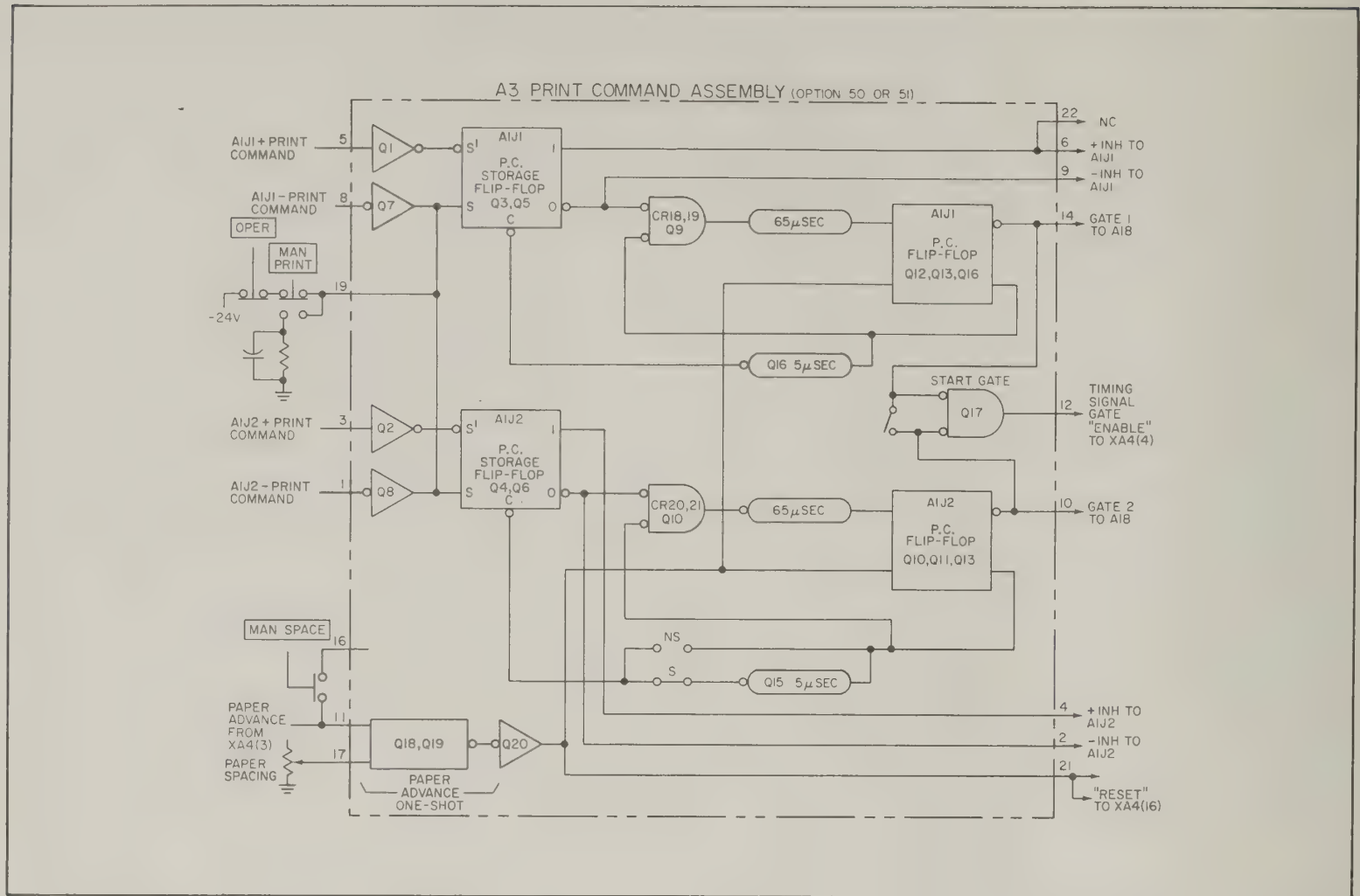
- REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
- UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS;

NO PREFIX	A2	A3	A15
CI		CI-15 CRI-24	
JI			LI PI
RI-2 SI-3		Q1-10 RI-70 SI-2	

DELETED
C6-9

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Figure 7-7. Print Command Board A3 (Standard)



FUNCTIONS

a. Enables data transfer. In either S1 setting, print command at either input connector causes a differentiated 100 μ sec signal to be fed back to activated input board assembly (AIJ1 or AIJ2). Trailing edge of this signal enables data transfer from data source to IC Buffer Storage units on input board. Data source is inhibited until this time. At end of transfer time, data source is released to acquire more data.

With S1 in 2 PC position, a positive print command turns Q1 on, "setting" flip-flop Q3, Q5. Output of Q3, Q5 flip-flop provides inhibit outputs to data source which generated the print command. Transistor Q5 collector goes negative, turning on Q9. After a delay of approximately 65 μ sec (due to R41 and C17), flip-flop Q12, Q14 is set, and Q16 resets flip-flop Q1, Q3 after an additional 5 μ sec delay (due to R68 and C20), also turning off Q9. Q9 cannot turn on again until flip-flop Q12, Q14 is reset by paper advance signal; if a second print command sets flip-flop Q3, Q5, inhibit will be present to data source until start of paper advance plus approximately 70 μ sec. With S1 in 2PC position, print cycle will not start until a print command is also received in the lower channel (may come before upper channel input), which operates like the channel described above. Transistors Q11 and Q12 must both be on for Q17 to conduct and initiate print cycle.

When S1 is in 1 PC position, the second flip-flops are slaved together so a print cycle will be initiated when a print command is received at either input connector.

b. Begins print cycles. Data transferred into IC Buffer Storage circuits is now input to Column Board Assemblies. Print command inputs, as selected by print command select switch (S1) start print cycle (which lasts 50 msec). If data acquisition of input device occurs within the 50 msec print period, a second print command will be generated, causing a new inhibit signal to hold off data source until end of print cycle. Start gate output, when high, begins print cycle.

c. Ends print cycles. Approximately 50 msec after start gate output goes high, input signal at A3 (11) goes high, indicating that all possible printing has occurred, and paper should be advanced. The following events occur on A3 at end of print cycle:

- 1) Paper advance one-shot output goes high for a period determined by setting of paper spacing R2.
- 2) Print command flip-flops are reset to await new input print commands, thus closing start gate.
- 3) Inductive kick at end of paper advance pulse is filtered out on A4 to reset Column Board Assembly control flip-flops (see Figures 7-8 and 7-9).

CONTROLS

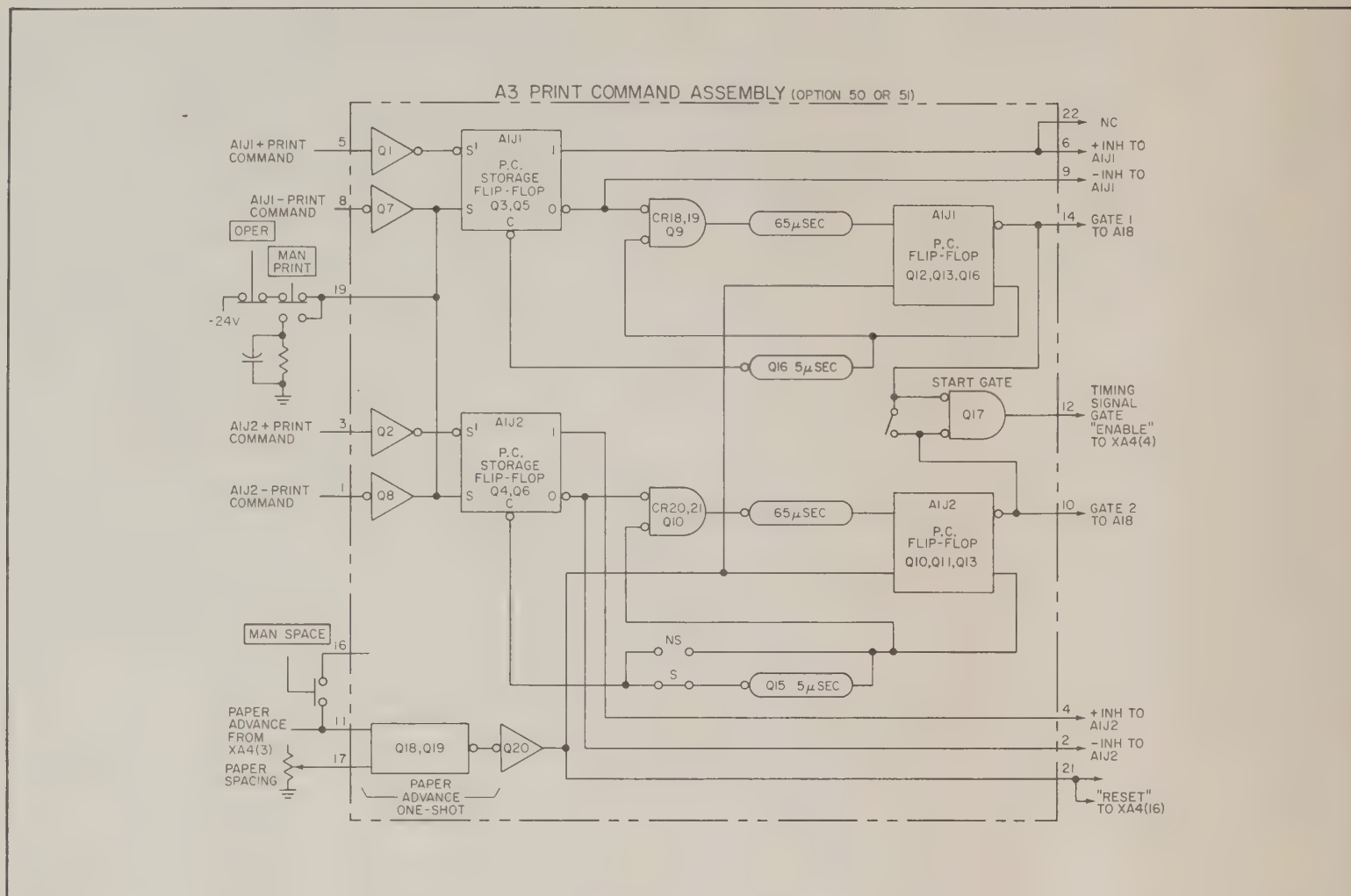
a. On board:

- 1) Print command selection switch S1. When switch is in upper position, print command at each input connector is required to start print cycle. When in lower position, print command at either input connector will cause data transfer at both inputs and will begin print cycle.

R63
 R66
 CR29
 (R72)
 CR2
 C2
 R2
 C7
 R4
 Q2
 CR5
 C9
 R8
 R7
 R10
 R14
 R12
 Q4
 R17
 R19
 R25
 Q6
 CR11
 CR12
 R21
 C26
 CR28
 R62
 R65
 (R71)
 R24
 CR15
 C11
 R29
 CR6
 Q8
 R28
 C13
 R33
 C1
 CR13
 R22
 R32

- 2) S/NS jumper. instruments with option 51) and on moved to NSpc so it can be used for A1J2. Fit together to ensure A1J2 for full panel and print unchanged.
- 3) Resistors R71 board assembly those normally provided to add voltage. Follow divider applies added resistor unless the 100 cordingly. With voltage can be voltage can be tively. If a less of R66 may be same, except 1
- 4) OPER. Both pins held in their "r at A3(19), prevent either flip-flop opens -24V circuit command as demand selection

Figure 7-8
 PRINT COMMAND BOARD A3
 OPTION 50/51



FUNCTIONS

a. Enables data transfer. In either S1 setting, print command at either input connector causes a differentiated 100 μ sec signal to be fed back to activated input board assembly (AIJ1 or AIJ2). Trailing edge of this signal enables data transfer from data source to IC Buffer Storage units on input board. Data source is inhibited until this time. At end of transfer time, data source is released to acquire more data.

With S1 in 2 PC position, a positive print command turns Q1 on, "setting" flip-flop Q3, Q5. Output of Q3, Q5 flip-flop provides inhibit outputs to data source which generated the print command. Transistor Q5 collector goes negative, turning on Q9. After a delay of approximately 65 μ sec (due to R41 and C17), flip-flop Q12, Q14 is set, and Q16 resets flip-flop Q1, Q3 after an additional 5 μ sec delay (due to R68 and C20), also turning off Q9. Q9 cannot turn on again until flip-flop Q12, Q14 is reset by paper advance signal; if a second print command sets flip-flop Q3, Q5, inhibit will be present to data source until start of paper advance plus approximately 70 μ sec. With S1 in 2PC position, print cycle will not start until a print command is also received in the lower channel (may come before upper channel input), which operates like the channel described above. Transistors Q11 and Q12 must both be on for Q17 to conduct and initiate print cycle.

When S1 is in 1 PC position, the second flip-flops are slaved together so a print cycle will be initiated when a print command is received at either input connector.

b. Begins print cycles. Data transferred into IC Buffer Storage circuits is now input to Column Board Assemblies. Print command inputs, as selected by print command select switch (S1) start print cycle (which lasts 50 msec). If data acquisition of input device occurs within the 50 msec print period, a second print command will be generated, causing a new inhibit signal to hold off data source until end of print cycle. Start gate output, when high, begins print cycle.

c. Ends print cycles. Approximately 50 msec after start gate output goes high, input signal at A3 (11) goes high, indicating that all possible printing has occurred, and paper should be advanced. The following events occur on A3 at end of print cycle:

- 1) Paper advance one-shot output goes high for a period determined by setting of paper spacing R2.
- 2) Print command flip-flops are reset to await new input print commands, thus closing start gate.
- 3) Inductive kick at end of paper advance pulse is filtered out on A4 to reset Column Board Assembly control flip-flops (see Figures 7-8 and 7-9).

CONTROLS

a. On board:

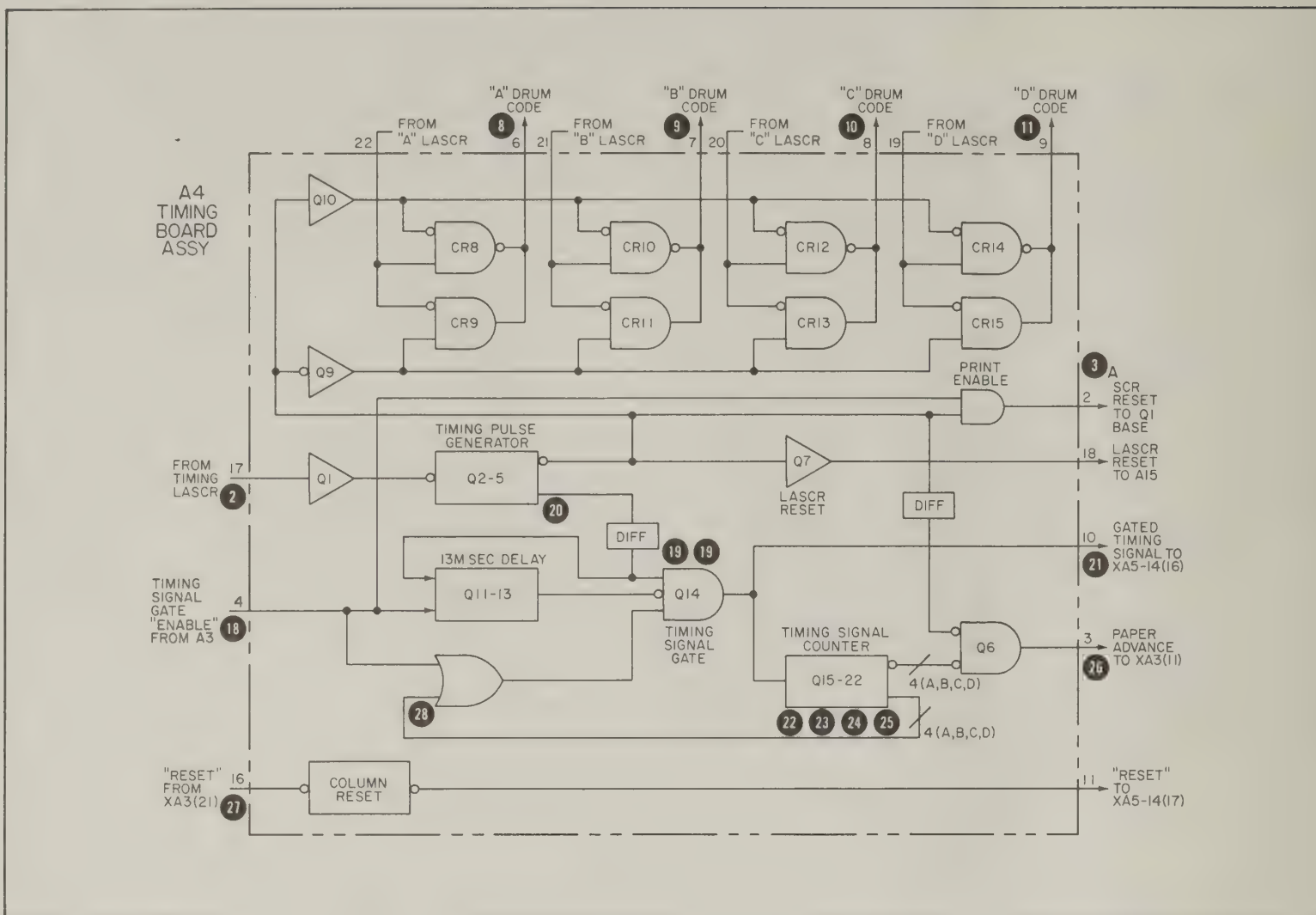
- 1) Print command selection switch S1. When switch is in upper position, print command at each input connector is required to start print cycle. When in lower position, print command at either input connector will cause data transfer at both inputs and will begin print cycle.

- 5) MAN PRINT. When depressed, opens -24V circuit to A3(19) and provides one positive print command to both print command flip-flops, starting a single print cycle. As long as pushbutton is depressed, -24V circuit to A3(19) is open, and 5050A will print upon command (as if OPER pushbutton were depressed); however only one print command is generated by MAN PRINT each time it is depressed.
- 6) MAN SPACE. When depressed, generates a positive pulse at A3(11) to trigger paper advance one-shot to advance paper one space without printing.

- a. Operate 5050B with A3 mounted on 05050-6024 Extender Assembly (part of 05050-6023 Service Kit).
- b. Check for paper advance one-shot output at A3(21) when MAN SPACE pushbutton is pressed.
- c. Check for start gate and paper advance one-shot outputs when MAN PRINT pushbutton is pressed.
- d. Check for print command storage flip-flop outputs (inhibit signals) when triggered by print command inputs.
- e. Check for start gate inputs when MAN PRINT is pressed.
- f. Check effects of print command select switch settings.



7-17



FUNCTIONS

a. Generate timing and code signals. Timing Board Assembly continuously receives outputs from timing and code LASCs in Mechanism Assembly. Timing Board Assembly continuously provides drum position code signals to Column Board Assemblies, LASC reset pulses to Mechanism Assembly, drive for SCR Reset circuit to turn off any conducting SCRs on column boards. SCR Reset drive is gated to prevent premature printout when 5050B is turned on, and reduces power requirements when unit is not printing. Timing signal output is gated to enable printing only upon command to A3 (see Figure 7-6).

b. Generate end-of-print signal. The gated timing signals are counted by a 4-stage binary counter. A count of 16 equals one print drum revolution, during which all possible code comparisons will have been made.

c. Provide reset signal to column boards. A differentiating circuit on A4 passes the spike occurring at end of paper advance one-shot output (see Figure 7-6) to Column Board Assemblies to reset all control flip-flops. This is last signal to occur in a print cycle, and prevents any hammer from printing twice during the same line (eg. paper must be advanced between prints).

CONTROLS

None.

TROUBLESHOOTING

a. Operate 5050B with A4 mounted on 05050-6024 Extender Assembly (part of 05050-6023 Service Kit).

b. Check for timing signal gate "enable" signal at A4(4).

c. Check for input signals from timing and code LASCs.

d. Check for gated timing pulse output.

e. Check for drum position code outputs to Column Board Assemblies.

f. Check for LASC and SCR reset signals at A4(18) and A4(2).

g. Check for Column Board Assembly "reset" signal.

h. Check for 13 msec delay between leading edge of signal at A4(4) and first gated timing pulse at A4(10). Some important functions of this delay are:

- 1) Allows adequate time for paper advance when operating at maximum print rate (20 lines/second).
- 2) Allows charging time on input lines by providing delay between print command and print action.

R71
R68
R72
C19
CR27
R76
R75
CR24
R63
C15
R64
R67
CR22

C14
R57
R49
R96
CR17
C10
R52
R51

C30
CR18
R46
C6
R101
R102
R18
R17
CR36
C4

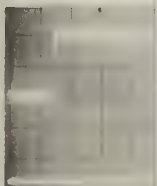
R16
R43
R100

3 Q23
CR37

26



2

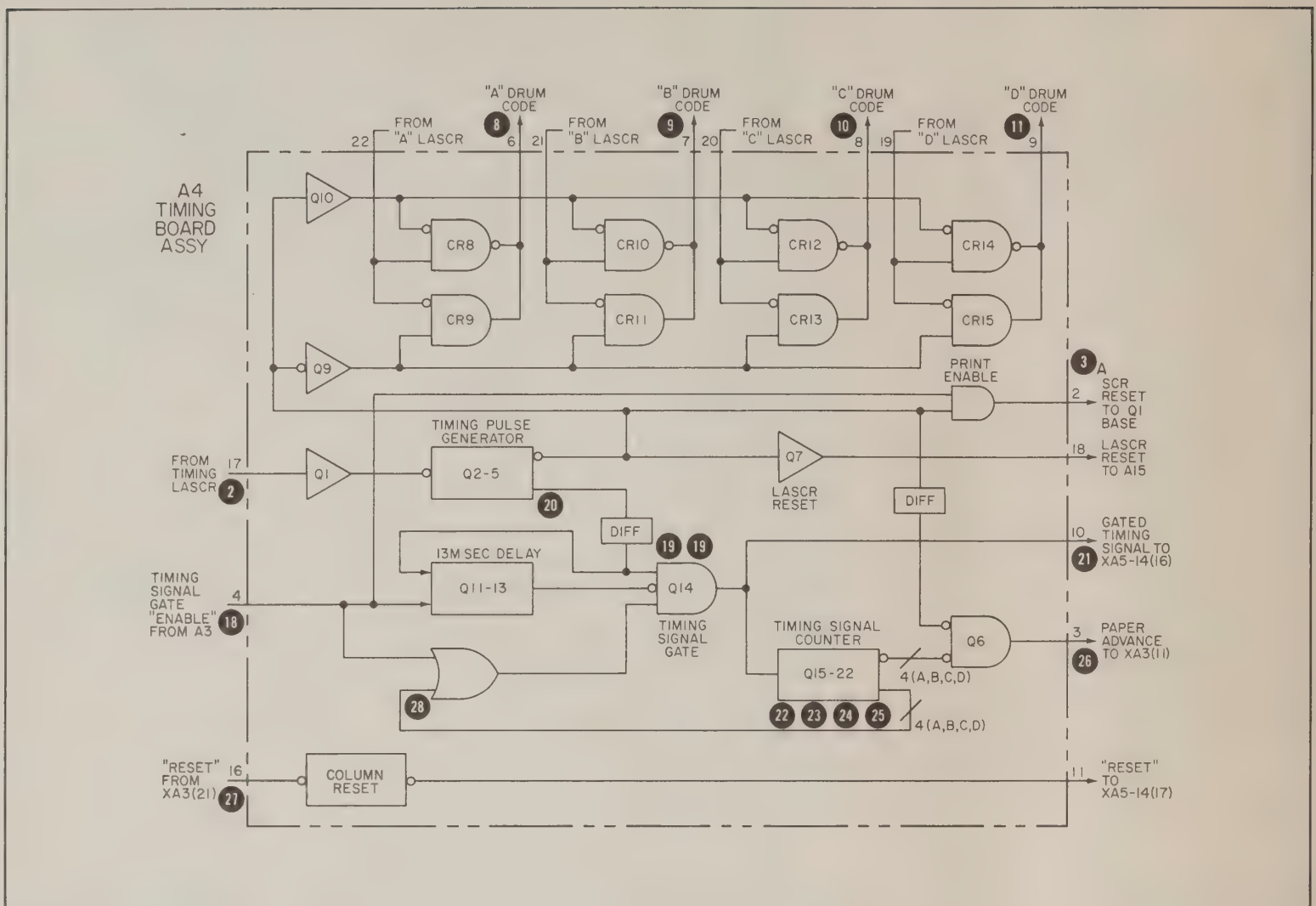


19 10V

19 A 10V

H: 10

Sync: +EX



FUNCTIONS

a. Generate timing and code signals. Timing Board Assembly continuously receives outputs from timing and code LASCs in Mechanism Assembly. Timing Board Assembly continuously provides drum position code signals to Column Board Assemblies, LASC reset pulses to Mechanism Assembly, drive for SCR Reset circuit to turn off any conducting SCRs on column boards. SCR Reset drive is gated to prevent premature printout when 5050B is turned on, and reduces power requirements when unit is not printing. Timing signal output is gated to enable printing only upon command to A3 (see Figure 7-6).

b. Generate end-of-print signal. The gated timing signals are counted by a 4-stage binary counter. A count of 16 equals one print drum revolution, during which all possible code comparisons will have been made.

c. Provide reset signal to column boards. A differentiating circuit on A4 passes the spike occurring at end of paper advance one-shot output (see Figure 7-6) to Column Board Assemblies to reset all control flip-flops. This is last signal to occur in a print cycle, and prevents any hammer from printing twice during the same line (eg. paper must be advanced between prints).

CONTROLS

None.

TROUBLESHOOTING

a. Operate 5050B with A4 mounted on 05050-6024 Extender Assembly (part of 05050-6023 Service Kit).

b. Check for timing signal gate "enable" signal at A4(4).

c. Check for input signals from timing and code LASCs.

d. Check for gated timing pulse output.

e. Check for drum position code outputs to Column Board Assemblies.

f. Check for LASC and SCR reset signals at A4(18) and A4(2).

g. Check for Column Board Assembly "reset" signal.

h. Check for 13 msec delay between leading edge of signal at A4(4) and first gated timing pulse at A4(10). Some important functions of this delay are:

- 1) Allows adequate time for paper advance when operating at maximum print rate (20 lines/second).
- 2) Allows charging time on input lines by providing delay between print command and print action.

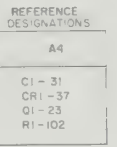
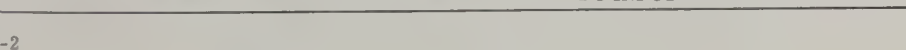


Figure 7-9. Timing Board A4

FUNCTIONS

a. Simultaneously compares drum position code from timing board against data input from each of two input columns.

b. Provides an output which can drive a print hammer to print correct character, when drum position code coincides with data input code.

c. One character in either column can be suppressed (made to be a "blank" in the printed output); suppression program can be defeated, causing suppressed character to be printed (see Section II).

d. Input data biases diodes in code comparison gate and controls conduction of character suppression gate diode. When drum position code agrees with input data, both gated timing pulse and inverted gated timing pulse are present at coincidence gate inputs. Inverted gated timing pulse turns off coincidence gate transistor, allowing gated timing pulse to trigger control flip-flop to its "set" state. When control flip-flop switches to "set", its output causes SCR to conduct, and print hammer connected to output pin strikes paper against wheel printing character above it. SCR is turned off at end of timing pulse (see Section III), control flip-flop is reset at end of print cycle, preventing further printing by that column until paper advances.

e. Character suppression program prevents printing by not providing input to timing pulse inverter for character to be suppressed. Suppression defeat uses inverted gated timing pulse from next more significant column as input to coincidence gate, bypassing timing pulse inverter.

CONTROLS

a. On board: Character suppression (plug-in diodes). Coincidence gate for either column requires both gated timing signal pulses from A4 and inverted timing pulses in order to provide an output that will cause printing for that column. Character suppression is achieved by allowing input data to control drive to timing pulse inverter. Character suppression gate diode is reverse-biased by H and L REF voltages at column board assembly inputs. Plug-in diodes are installed to allow input data to forward-bias gate diode, enabling an inverted timing pulse to be generated and printing to occur. Installing a plug-in diode for any one line in the "H" position indicated in Figure 2-4 (corresponding to the left position in schematic portion of this Figure) enables an H input on that line to forward-bias character suppression gate diode, so printing can occur whenever that line is H; a similar situation applies when the plug-in diode is installed in the "L" position (L codes enable printing) for any one line. When plug-in diodes are installed for both "H" and "L" positions of any one data input line, character suppression gate is open for all input codes, so any input code can cause printing.

b. Suppression defeat jumpers. Character suppression program set up by plug-in diodes can be defeated when suppression defeat (plug-in) jumper for that column is in its upper position. When jumper is

in upper position, suppressed character is printed when there is printout from next higher-numbered column. Suppression defeat jumpers allow inverted timing pulse from a more significant column to be substituted for timing pulse inverter output of less significant column.

TROUBLESHOOTING

a. If failure seems to be in a single column, or randomly to involve several columns, trouble source is probably in Column Board Assembly (or assemblies).

b. If failure involves only column boards at one input connector, perform checks of data source at that connector. (Exchange data source input connections, etc.)

c. If trouble seems to be in all 5050B columns, check common circuits (A3, A4, A15, power supply).

d. Column boards can be interchanged, providing checks of whether trouble is associated with the board assembly or with a given column board position or input data.

e. Operate 5050B with column board assembly installed in 05050-6024 Extender Assembly (part of 05050-6023 Service Kit).

f. No printout:

- 1) Check column board output fuse for inoperative column.
- 2) Install plug-in diodes in both "H" and "L" positions for one input line of inoperative column.
- 3) Feed same data to inoperative column and one that is operating (best use other column on same board).
- 4) Sync oscilloscope to test point 35 of operating column. Compare waveforms and dc voltages of good and bad columns.

g. Wrong printout:

- 1) Feed same data to bad column and a good column (on same board, if possible).
- 2) Analyze printed output of bad column versus input to that column. (How does code for printed output compare with input code, etc?).
- 3) Sync oscilloscope to test point 35 of good column. Compare waveforms and dc voltage levels of good and bad columns.
- 4) Remove plug-in diodes and suppression defeat jumper for bad column. Feed as many data input codes as possible to bad column to attempt to cause it to print. If printing occurs with diodes removed, begin point-by-point voltage and waveform comparisons against good column.

EVE
COLUI

OD
COLL

Figure 7-10
COLUMN BOARD ASSEMBLY A5-A14
(OPTION 20)

FUNCTIONS

a. Simultaneously compares drum position code from timing board against data input from each of two input columns.

b. Provides an output which can drive a print hammer to print correct character, when drum position code coincides with data input code.

c. One character in either column can be suppressed (made to be a "blank" in the printed output); suppression program can be defeated, causing suppressed character to be printed (see Section II).

d. Input data biases diodes in code comparison gate and controls conduction of character suppression gate diode. When drum position code agrees with input data, both gated timing pulse and inverted gated timing pulse are present at coincidence gate inputs. Inverted gated timing pulse turns off coincidence gate transistor, allowing gated timing pulse to trigger control flip-flop to its "set" state. When control flip-flop switches to "set", its output causes SCR to conduct, and print hammer connected to output pin strikes paper against wheel printing character above it. SCR is turned off at end of timing pulse (see Section III), control flip-flop is reset at end of print cycle, preventing further printing by that column until paper advances.

e. Character suppression program prevents printing by not providing input to timing pulse inverter for character to be suppressed. Suppression defeat uses inverted gated timing pulse from next more significant column as input to coincidence gate, bypassing timing pulse inverter.

CONTROLS

a. On board: Character suppression (plug-in diodes). Coincidence gate for either column requires both gated timing signal pulses from A4 and inverted timing pulses in order to provide an output that will cause printing for that column. Character suppression is achieved by allowing input data to control drive to timing pulse inverter. Character suppression gate diode is reverse-biased by H and L REF voltages at column board assembly inputs. Plug-in diodes are installed to allow input data to forward-bias gate diode, enabling an inverted timing pulse to be generated and printing to occur. Installing a plug-in diode for any one line in the "H" position indicated in Figure 2-4 (corresponding to the left position in schematic portion of this Figure) enables an H input on that line to forward-bias character suppression gate diode, so printing can occur whenever that line is H; a similar situation applies when the plug-in diode is installed in the "L" position (L codes enable printing) for any one line. When plug-in diodes are installed for both "H" and "L" positions of any one data input line, character suppression gate is open for all input codes, so any input code can cause printing.

b. Suppression defeat jumpers. Character suppression program set up by plug-in diodes can be defeated when suppression defeat (plug-in) jumper for that column is in its upper position. When jumper is

in upper position, suppressed character is printed when there is printout from next higher-numbered column. Suppression defeat jumpers allow inverted timing pulse from a more significant column to be substituted for timing pulse inverter output of less significant column.

TROUBLESHOOTING

a. If failure seems to be in a single column, or randomly to involve several columns, trouble source is probably in Column Board Assembly (or assemblies).

b. If failure involves only column boards at one input connector, perform checks of data source at that connector. (Exchange data source input connections, etc.)

c. If trouble seems to be in all 5050B columns, check common circuits (A3, A4, A15, power supply).

d. Column boards can be interchanged, providing checks of whether trouble is associated with the board assembly or with a given column board position or input data.

e. Operate 5050B with column board assembly installed in 05050-6024 Extender Assembly (part of 05050-6023 Service Kit).

f. No printout:

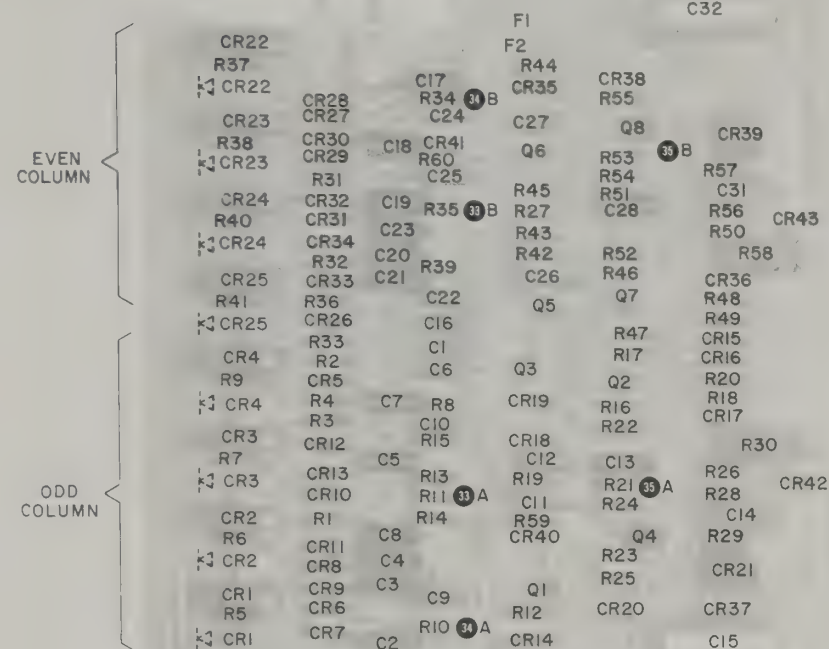
- 1) Check column board output fuse for inoperative column.
- 2) Install plug-in diodes in both "H" and "L" positions for one input line of inoperative column.
- 3) Feed same data to inoperative column and one that is operating (best use other column on same board).
- 4) Sync oscilloscope to test point 35 of operating column. Compare waveforms and dc voltages of good and bad columns.

g. Wrong printout:

- 1) Feed same data to bad column and a good column (on same board, if possible).
- 2) Analyze printed output of bad column versus input to that column. (How does code for printed output compare with input code, etc?).
- 3) Sync oscilloscope to test point 35 of good column. Compare waveforms and dc voltage levels of good and bad columns.
- 4) Remove plug-in diodes and suppression defeat jumper for bad column. Feed as many data input codes as possible to bad column to attempt to cause it to print. If printing occurs with diodes removed, begin point-by-point voltage and waveform comparisons against good column.

COLUMN OUTPUT TO PRINT HAMMERS
EVEN ODD
36 B 36 A

SUPPRESSION DEFEAT JUMPERS
ODD COLUMN EVEN COLUMN
OPEN CLOSED OPEN CLOSED



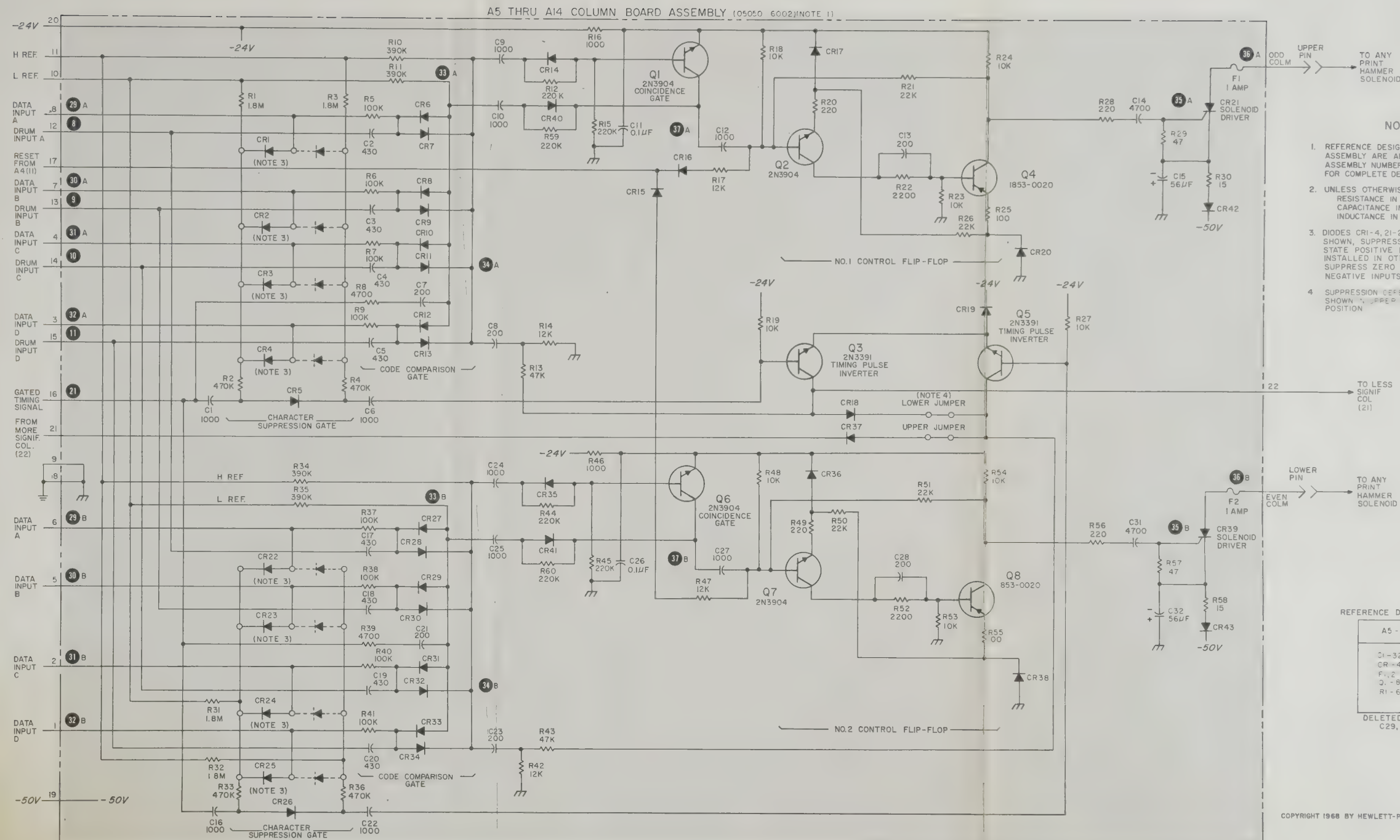
INDICATES ALTERNATE POSITION



50 V/cm
20V/cm

H: 1 ms/cm
Sync: +EXT AC to 36
of good column

Note: Upper trace is test point 36.
Lower trace is test point 35 of same column.
Sweep time switch was set to 10 ms/cm, and Horiz Expand set to X10, resulting in 1 msec/cm display.
Oscilloscope was sync'd to test point 35 of other column on board. Input data to this column was set to trigger scope before column shown in display had print-out. Horiz position control was adjusted to center pattern.



NOTES

- REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
- UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS, CAPACITANCE IN PICOFARADS, INDUCTANCE IN MICROHENRIES.
- DIODES CR1-4, 21-24, INSTALLED AS SHOWN, SUPPRESS ZERO FOR "1" STATE POSITIVE INPUTS. INSTALLED IN OTHER POSITION, SUPPRESS ZERO FOR "1" STATE NEGATIVE INPUTS.
- SUPPRESSION DEFEAT JUMPER SHOWN IN UPPER CLOSED POSITION.

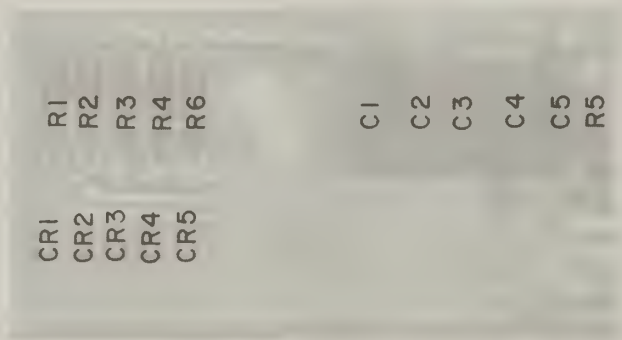
REFERENCE DESIGNATIONS

A5 - A4
C1-32
CR-43
F1, 2
Q-8
R1-60

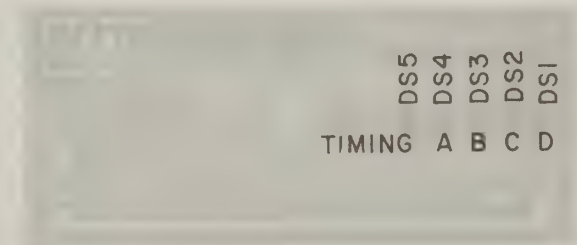
DELETED,
C29, 30

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05050-D-124

Figure 7-10. Column Boards A5-A14 (Option 20)



A15A1



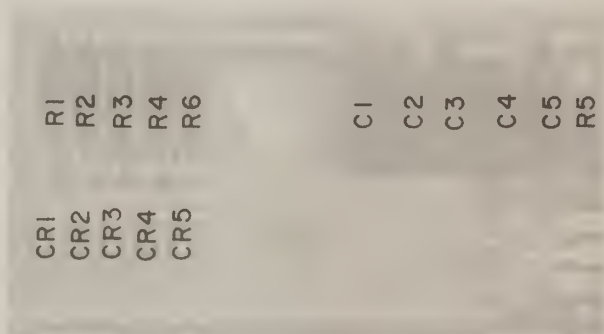
A15A2

Figure 7-11

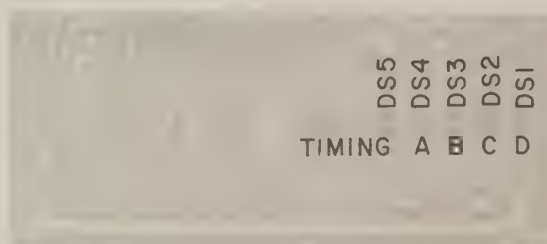
MECHANISM ASSEMBLY A15

(Sheet 1 of 2)

7-23



A15A1



A15A2

FUNCTIONS (A15 Mechanism Assembly)

Provides printed output from 5050B. Characters to be printed are on print wheels (one for each of the 18 printer columns) that are assembled into the print drum. A code disc, turning with the print drum, provides (optically generated) drum position and timing signal inputs to Timing Board Assembly A4, which converts them and gates them for use in code comparison process on Column Board Assemblies.

Printing in any column occurs when the print hammer for that column strikes the paper, forcing it against rotating print drum. Hammer dwell time is insufficient to cause vertical smearing of printed character. Print hammers are controlled by outputs of Column Board Assembly columns to which they are connected.

One print drum revolution after timing signal gate (on A4) opened, paper is advanced. Paper advance is controlled by the Paper Advance one-shot and driver on A3 (standard or Option 50 or 51).

CONTROLS

- A. On assembly:
- 1) Timing adjustments (see Section IV).
 - a) Optical Encoder Assembly position;
 - b) Individual hammer position.
 - 2) Paper advance adjustments (see Section IV).
 - 3) Paper guard adjustments (spacing between paper and print drum) (see Section IV).
- B. Off assembly:
- 1) MAN SPACE advances paper. Acts through A3.
 - 2) MAN PRINT enables printing. Acts through A3 and A4.
 - 3) Paper spacing adjustment, R2. Determines distance paper is advanced by each paper advance pulse.
 - 4) POWER switch. Controls ac line power to printer motor.

TROUBLESHOOTING

(For parts replacement and adjustment procedures, see Section IV)

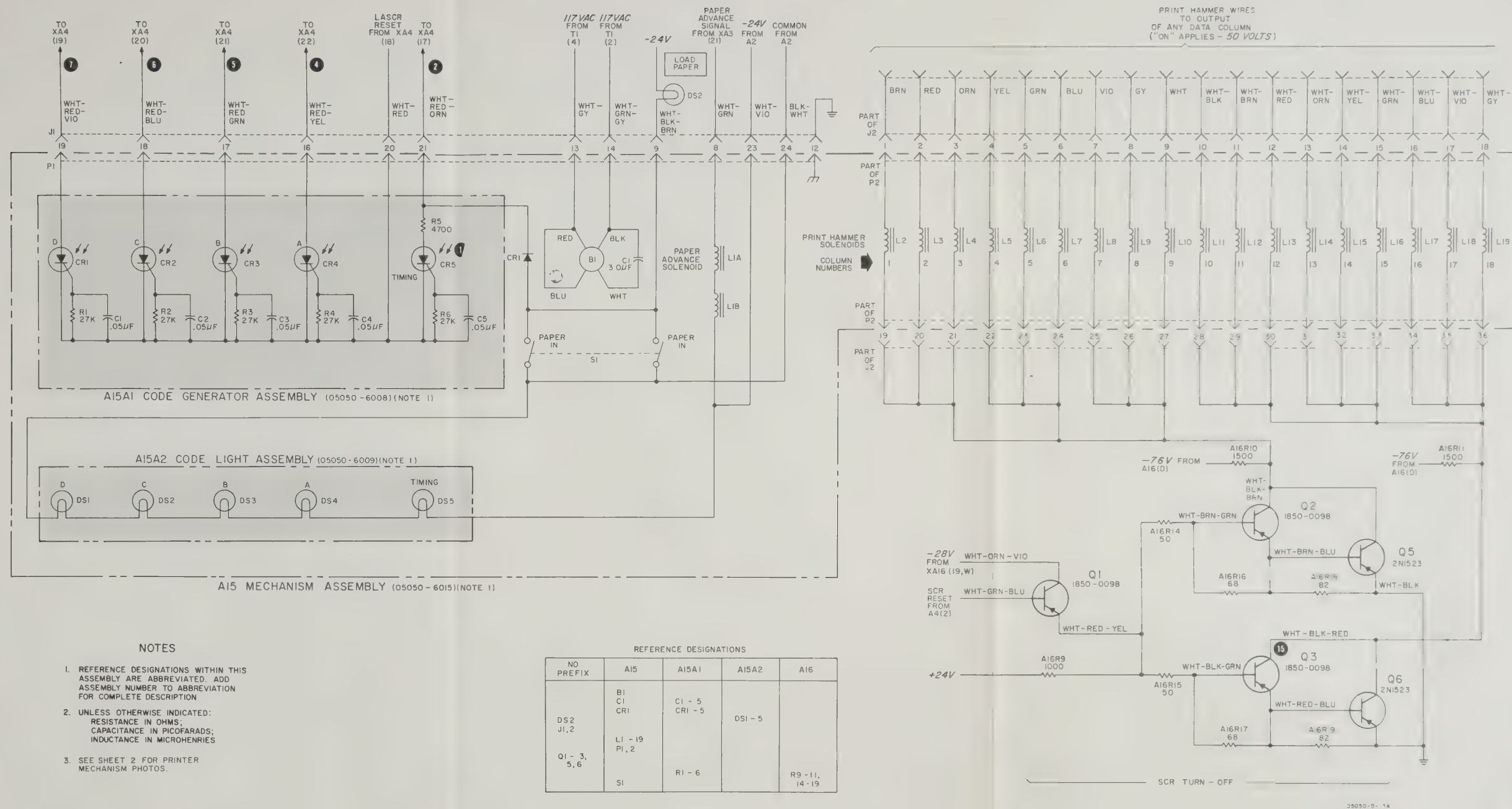
a. Timing adjustments: Generally required when: 1) line frequency changes; 2) code disc is changed; 3) inked roller is installed or removed; 4) print hammer or print wheel is installed or removed; 5) characters are printed with tops or bottoms missing, (see sample tape of Figure 4-2). Before any adjustments are made, check -50V supply ($\pm 0.1V$) and code lamp intensity.

When viewed from right-hand side of mechanism, code disc and print drum turn counter-clockwise. When only tops of characters are printed, printing is occurring too early; when only bottoms are printed, it is occurring too late. Primary adjustment for retarding or advancing time of print is Optical Encoder Assembly position. Timing adjustment of individual print hammers should be done only after optimum timing for all columns has been set using Optical Encoder Assembly.

If code discs are changed, and optical encoder adjustment range is insufficient for optimum timing with new disc, reposition disc on end of print drum shaft. Tolerance between "D"-shaped hole in disc and key on end of shaft allows slight adjustment of disc position. Rotate disc CCW to advance timing, CW to retard timing.

b. Paper advance adjustment. With use, the paper advance roller may become so worn that paper advance adjustments in Section IV no longer provide proper advancing. When this happens, the paper advance roller should be replaced (Sect. IV).

c. Paper guard adjustment. Ink smearing on the paper, especially during prolonged idling periods, may be due to the paper lightly contacting the print drum as the drum rotates. Paper can be moved farther away by readjusting paper guard (harp string) to a lower position (Sect. IV); if harp string is too low, print hammers cannot hit paper against print drum and no printing, or poor printing, will occur.



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Figure 7-11. Mechanism Assembly A15
(Sheet 1 of 2)

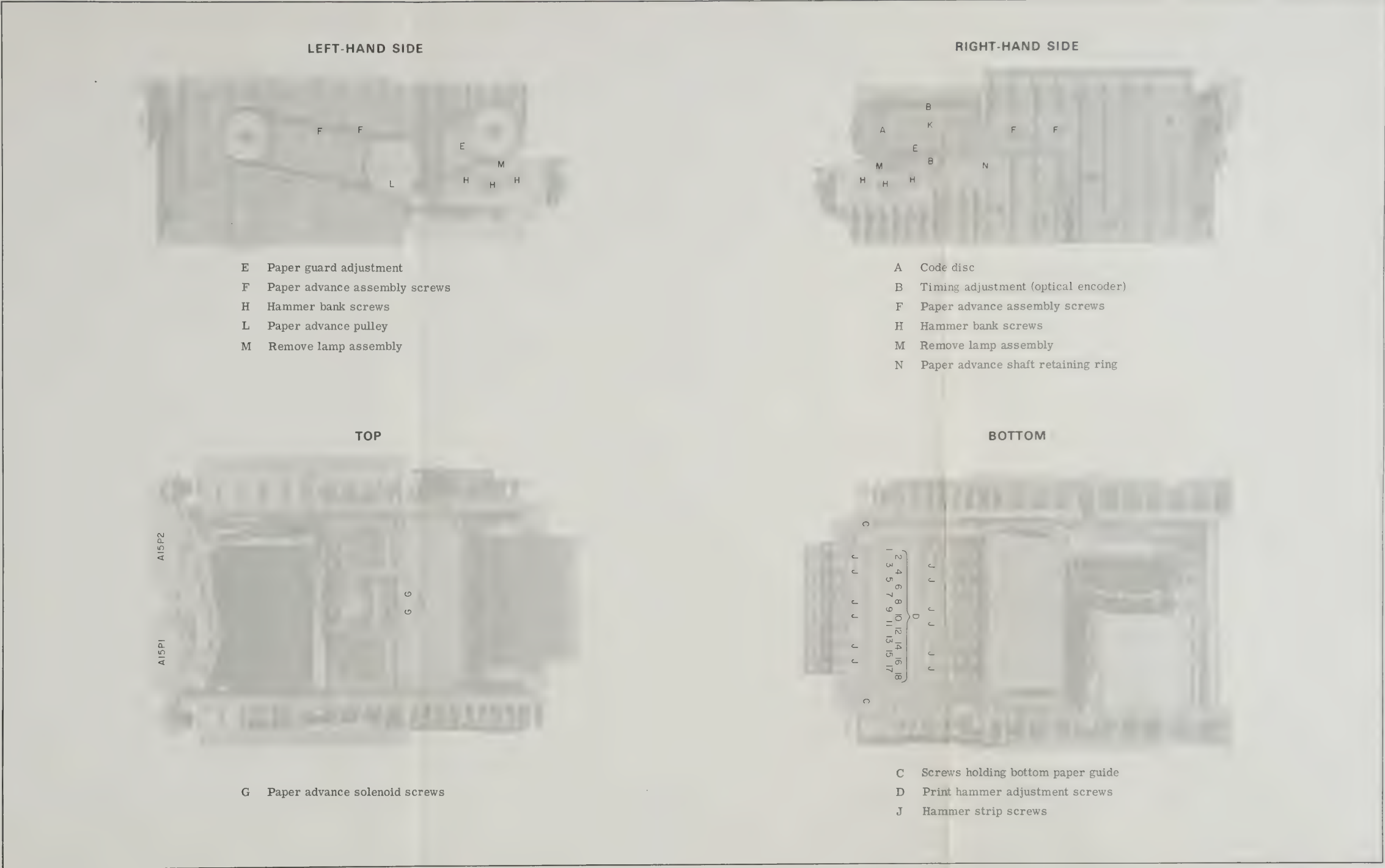
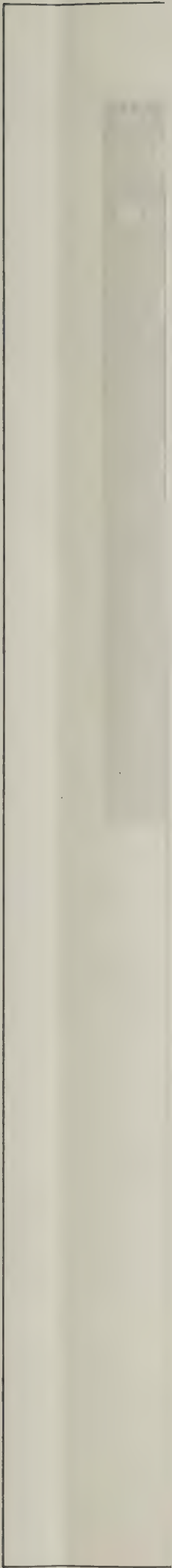
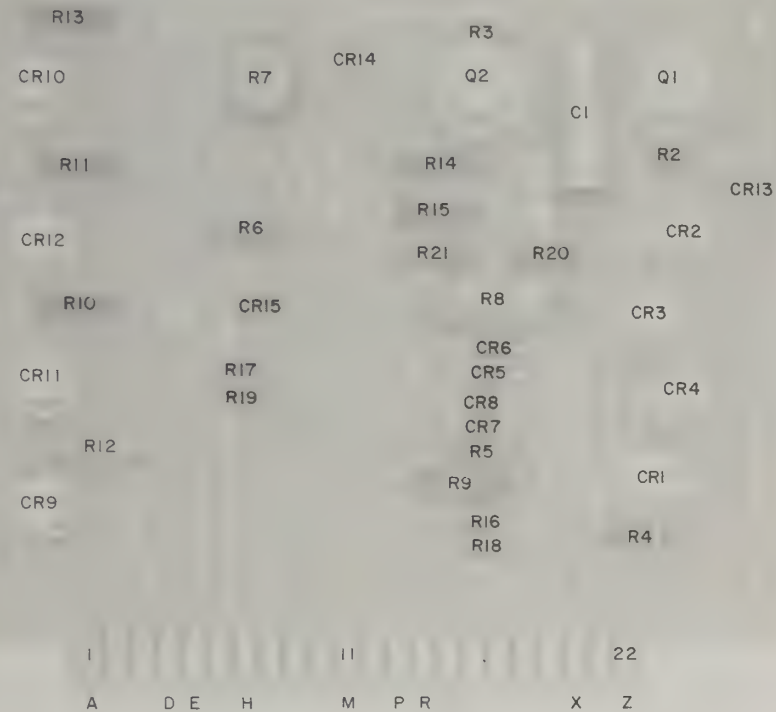


Figure 7-11. A15 Mechanism Assembly
(Sheet 2 of 2)



02800-2



FUNCTIONS

Provide regulated + and -24 volts and -50 volts, and unregulated 80 volts.

CONTROLS

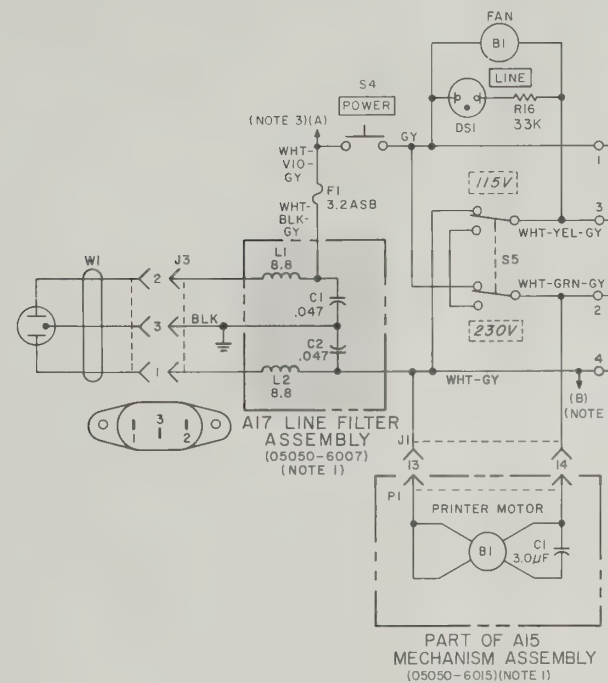
- On board
 - 50V adjust.
 - The $\pm 24V$ supplies are not adjustable.
- Off board.
 - 115/230V selector switch.
 - POWER switch. Controls line power to 5050B.

TROUBLESHOOTING

Voltages given on schematic diagram were measured on a 5050B (idling) with a HP Model 412A DC Voltmeter. These voltages are typical, and may vary from instrument to instrument. The -50V supply should be adjusted to $-50V \pm 0.1V$, measured with a HP Model 3430 DC Digital Voltmeter, or equivalent (required accuracy better than 0.2% at 50V).

NOTES

- REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
- UNLESS OTHERWISE INDICATED:
RESISTANCE IN OHMS;
CAPACITANCE IN PICOFARADS;
INDUCTANCE IN MICROHENRIES
- (A) TO L1 CLOCK OPTION ONLY
(B) TO T2 CLOCK OPTION ONLY
- VOLTAGES SHOWN WITH RECORDER IDLING (NOT PRINTING).



REFERENCE DESIGNATIONS

NO PREFIX	A15	A16	A17
B1 C2-7 DS1 F1 J1,3	B1 C1 P1	C1 CR1-15	C1,2 L1,2
Q1-3,5,6 8-13 S4,5 T1 W1		Q1,2 R2-21	

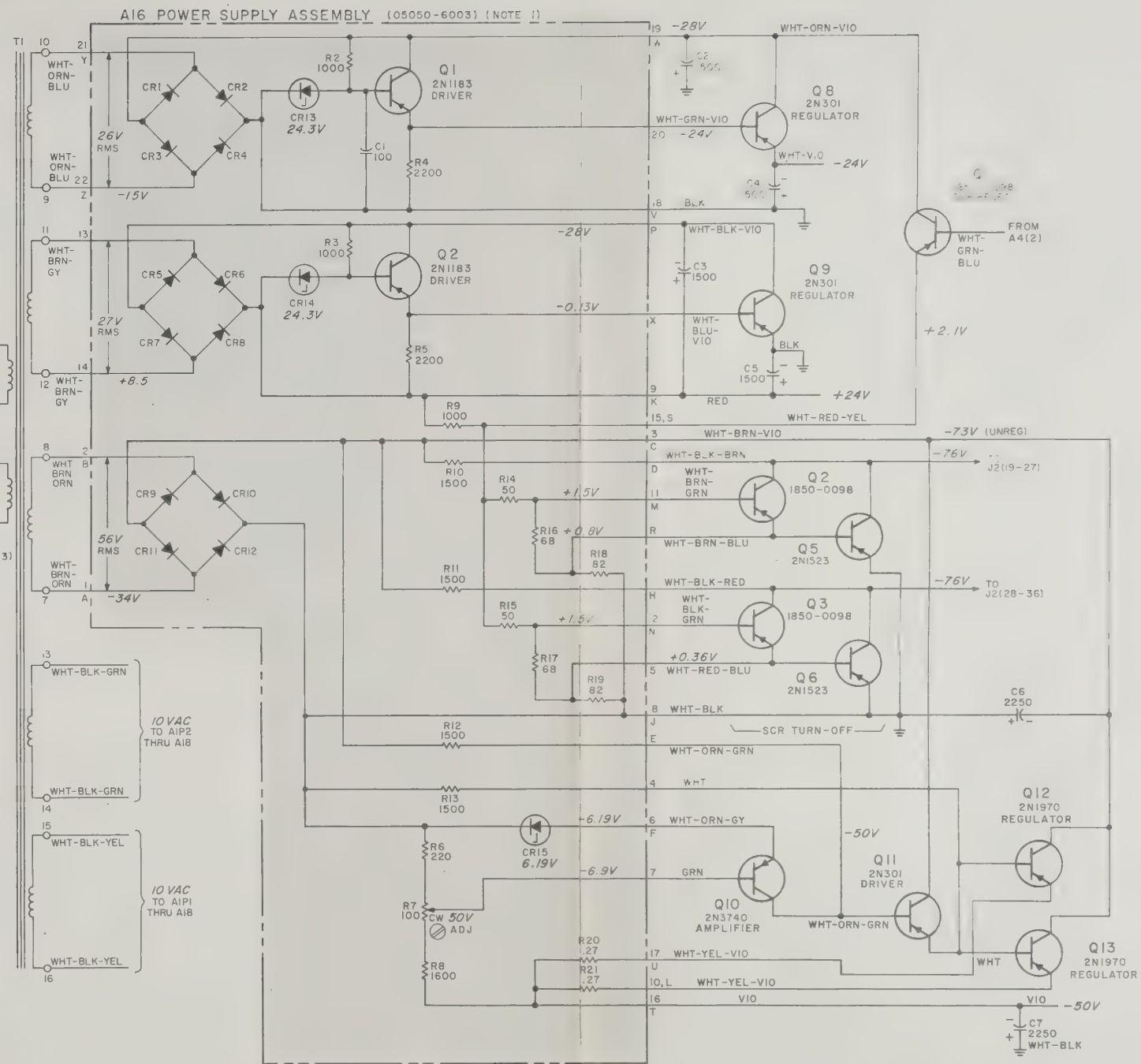


Figure 7-12. Power Supply A16

DIGITAL CLOCK (OPTION 55) SPECIFICATIONS

TIME BASE: Selectable to be 50 Hz, 60 Hz, or external. External requires 10 pps negative pulse (H = 0V or more positive, L = -2V to -20V, width 25 μ sec min.). External input accepts standard 1/4" 3-conductor phone plug. (Tip = "hot", ring = common, sleeve = no contact).

PRINT INTERVAL.

Internal: selectable: 1 sec, 10 secs, 1 min, 10 min. or 1 hour between prints. At each rate, hold-off signals are generated which prevent HP digital voltmeters and counters from operating during the intervals between printing.

External: (Normal 5050B operation.) Clock does not control. Rates up to 20 prints per sec determined by external devices.

TIME-OF-MEASUREMENT ACCURACY: Time recorded may be 0.1 sec less than correct time \pm line accuracy. (If external print command is received at the time a one-tenth second step would occur, switching is delayed until after print is completed.)

VISUAL INDICATION: 6 digital display tubes indicate to 23 hours, 59 minutes, 59 seconds.

PRINTED OUTPUT: 7 digits indicate to 23 hours, 59 minutes, 59.9 seconds.

OUTPUT CODE: +8421 or -8421 may be selected. Special recorder print wheels are available to adapt output to any other recorder input code.

PRINT FORMAT: Any of the 18 recorder columns may be used to print time digits.

CLOCK SET: Clock is electronically set to desired initial time by front panel switches.

DIMENSIONS: Mounts in HP 5050B Digital Recorder.

POWER: 115V or 230V \pm 10%. 50 Hz or 60 Hz (independent of 5050B OFF-ON switch). Approx. 8W.

The following parts are included in instruments which have the Digital Clock (Option 55) installed. The Digital Clock is available as a Clock Kit for field installation. The HP Part No. is 05050-6046. Print motor control kit (Option 15, 05050-6047) is also supplied as part of Option 55.

Assemblies and Chassis Parts			
Designation	Description	HP Part No.	Quantity
A19	Assy: Digital Clock Board	05050-6033	1
A20	Assy: Cable, clock to hammer	05050-6037	1
A21	Assy: Neon Lamp Board	05050-6034	1
A22	Assy: Clock Control	05050-6045	1
A23	Assy: Cable, clock to printer	05050-6036	1
J4	Jack: Telephone, Ext Time Base	1251-0191	1
L1	Inductor: Fixed 22 μ Hy	9140-0136	1
	Assy: Clock door	05050-6044	1
	Panel: Clock switches	05050-0046	1
	Bracket: Door latch	05050-0049	1
	Knob: Round, PRINT INTERVAL	0370-0193	1
	Kit: Motor Control, Option 15	05050-6047	1



Rear Panel

1. Open 5050B r
2. Perform colu
sources, as desc
umn board positi
switch and line f
3. Place termina
Hammer Cable A
position. Brown
board assembly.
on terminal boar
 - a. Tent
 - b. Secc
 - c. Tens
 - d. Minu
 - e. Tens
 - f. Hour
 - g. Tens

Connect print ha
printout format.
nected to any of
wires should be c
inal board assem

4. Close rear-p

Front Panel

1. Open left-han
tal Clock control
2. Set 115/230 sv
voltage are expos
line voltage.

DIGITAL CLOCK (OPTION 55) SPECIFICATIONS

TIME BASE: Selectable to be 50 Hz, 60 Hz, or external. External requires 10 pps negative pulse (H = 0V or more positive, L = -2V to -20V, width 25 μ sec min.). External input accepts standard 1/4" 3-conductor phone plug. (Tip = "hot", ring = common, sleeve = no contact).

PRINT INTERVAL.

Internal: selectable: 1 sec, 10 secs, 1 min, 10 min. or 1 hour between prints. At each rate, hold-off signals are generated which prevent HP digital voltmeters and counters from operating during the intervals between printing.

External: (Normal 5050B operation.) Clock does not control. Rates up to 20 prints per sec determined by external devices.

TIME-OF-MEASUREMENT ACCURACY: Time recorded may be 0.1 sec less than correct time \pm line accuracy. (If external print command is received at the time a one-tenth second step would occur, switching is delayed until after print is completed.)

VISUAL INDICATION: 6 digital display tubes indicate to 23 hours, 59 minutes, 59 seconds.

PRINTED OUTPUT: 7 digits indicate to 23 hours, 59 minutes, 59.9 seconds.

OUTPUT CODE: +8421 or -8421 may be selected. Special recorder print wheels are available to adapt output to any other recorder input code.

PRINT FORMAT: Any of the 18 recorder columns may be used to print time digits.

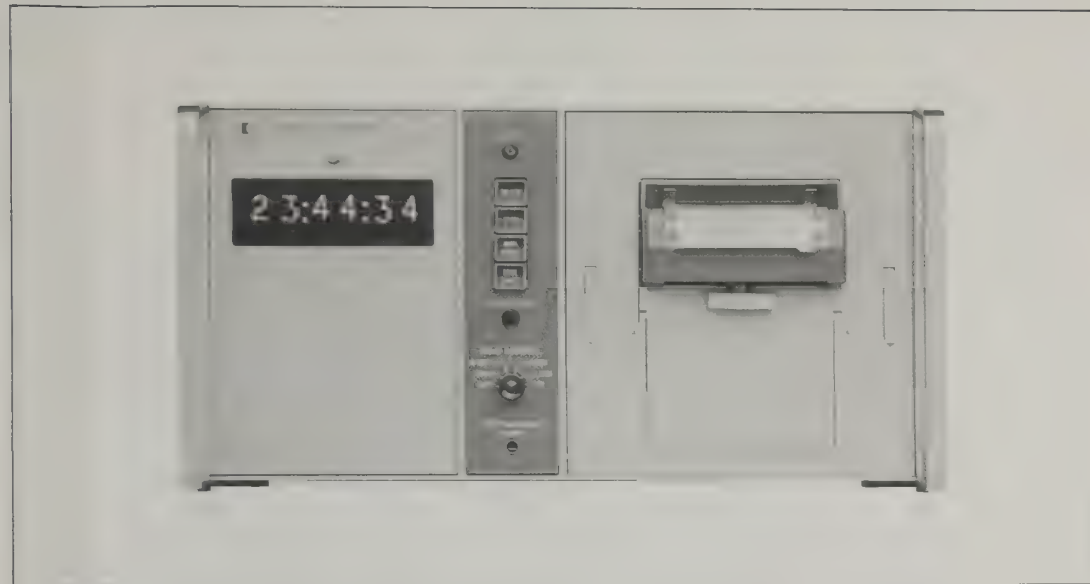
CLOCK SET: Clock is electronically set to desired initial time by front panel switches.

DIMENSIONS: Mounts in HP 5050B Digital Recorder.

POWER: 115V or 230V \pm 10%. 50 Hz or 60 Hz (independent of 5050B OFF-ON switch). Approx. 8W.

The following parts are included in instruments which have the Digital Clock (Option 55) installed. The Digital Clock is available as a Clock Kit for field installation. The HP Part No. is 05050-6046. Print motor control kit (Option 15, 05050-6047) is also supplied as part of Option 55.

Assemblies and Chassis Parts			
Designation	Description	HP Part No.	Quantity
A19	Assy: Digital Clock Board	05050-6033	1
A20	Assy: Cable, clock to hammer	05050-6037	1
A21	Assy: Neon Lamp Board	05050-6034	1
A22	Assy: Clock Control	05050-6045	1
A23	Assy: Cable, clock to printer	05050-6036	1
J4	Jack: Telephone, Ext Time Base	1251-0191	1
L1	Inductor: Fixed 22 μ Hy	9140-0136	1
	Assy: Clock door	05050-6044	1
	Panel: Clock switches	05050-0046	1
	Bracket: Door latch	05050-0049	1
	Knob: Round, PRINT INTERVAL	0370-0193	1
	Kit: Motor Control, Option 15	05050-6047	1



SETUP AND OPERATION

Rear Panel

1. Open 5050B rear panel door.
2. Perform column board setup procedure for data sources, as described in Section II. At least one column board position will be unused. Be sure 115/230 switch and line fuse are correct.
3. Place terminal board assembly portion of Clock to Hammer Cable Assembly A21 in unused column board position. Brown lead from clock should be at top of board assembly. From top to bottom, top seven pins on terminal board assembly represent:
 - a. Tenths-of-second digit.
 - b. Seconds digit.
 - c. Tens-of-seconds digit.
 - d. Minutes digit.
 - e. Tens-of-minutes digit.
 - f. Hours digit.
 - g. Tens-of-hours digit.

Connect print hammers as required to obtain desired printout format. Any print hammer lead can be connected to any of these pins. Unused print hammer wires should be connected to remaining pins on terminal board assembly.

4. Close rear-panel door.

Front Panel

1. Open left-hand front-panel door for access to Digital Clock controls.
2. Set 115/230 switch so numbers indicating your line voltage are exposed. The 1 amp fuse is used for either line voltage.

3. Connect 5050B to ac line.

4. Turn on clock power. Use toggle switch at left side of clock panel. Clock operates independently of 5050B printer.

5. Set SET/RUN to SET.

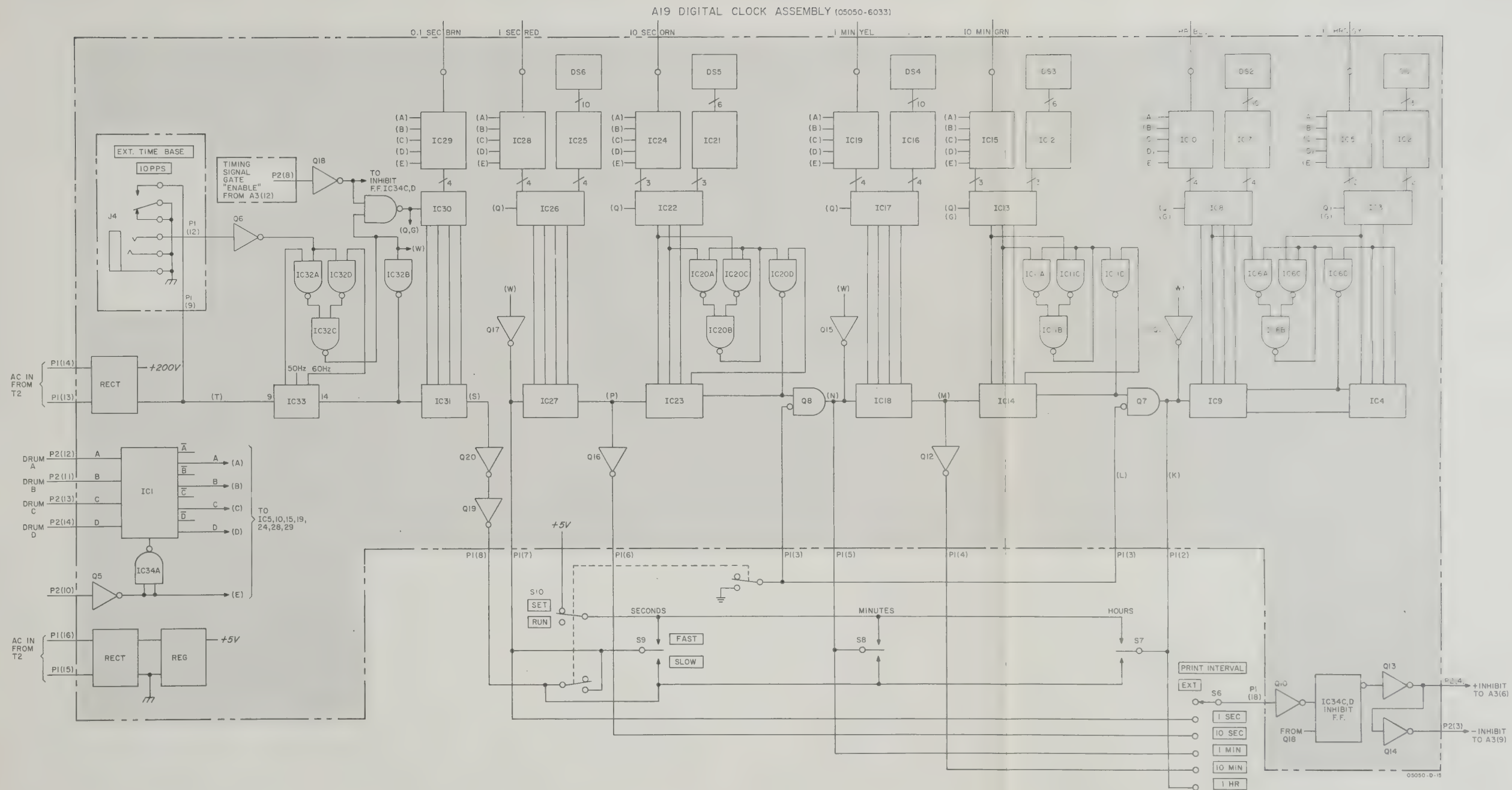
6. Set HOURS, MINUTES, SECONDS to time at which clock is to be started (there is no display of tenths-of-seconds). Use FAST setting of each switch to set tens of hours, minutes, seconds; use SLOW setting to set units of hours, minutes, seconds.

7. Start clock by switching SET/RUN to RUN.

8. Close and lock front-panel door.

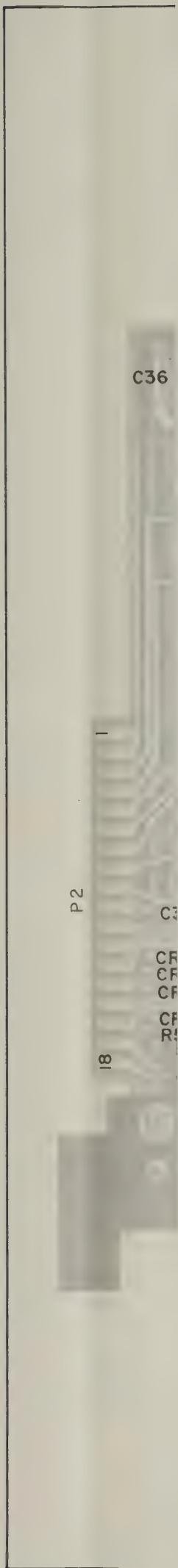
9. If print rate is not to be controlled by clock, set PRINT INTERVAL to EXT. The 5050B will operate normally, on receiving print commands from data sources.

10. If print rate is to be controlled by clock, set PRINT INTERVAL switch to desired rate. Print command select switch for A1J1 must be set to upper position, and a data source connected to A1J1. Clock inhibits data source connected to A1J1 until end of print interval. At end of print interval, data source cycles (collects data, generates print command, provides data to 5050B), and is again inhibited by clock until end of selected print interval.





DIGITAL CLOCK CONTROLS (OPTION 55)





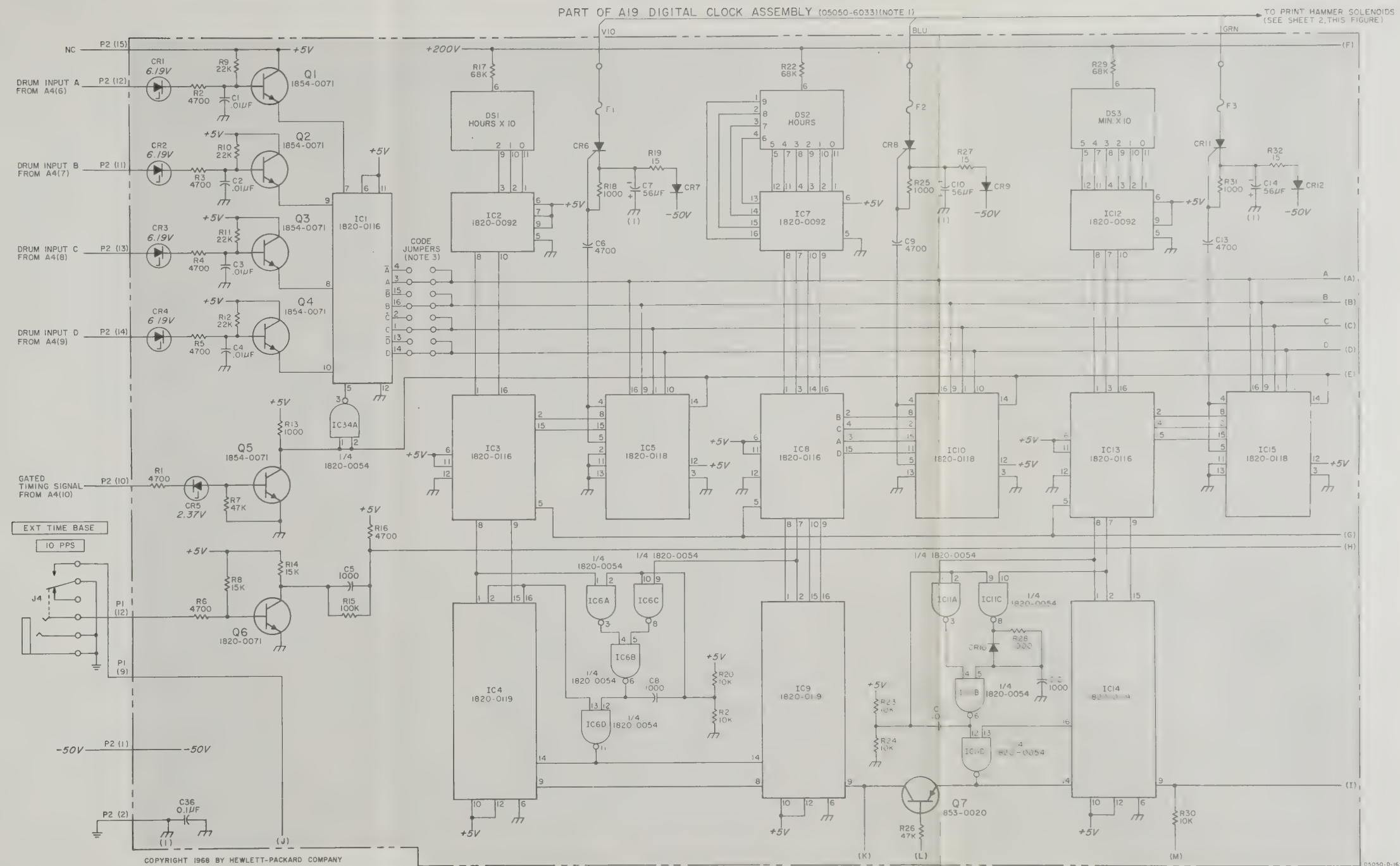
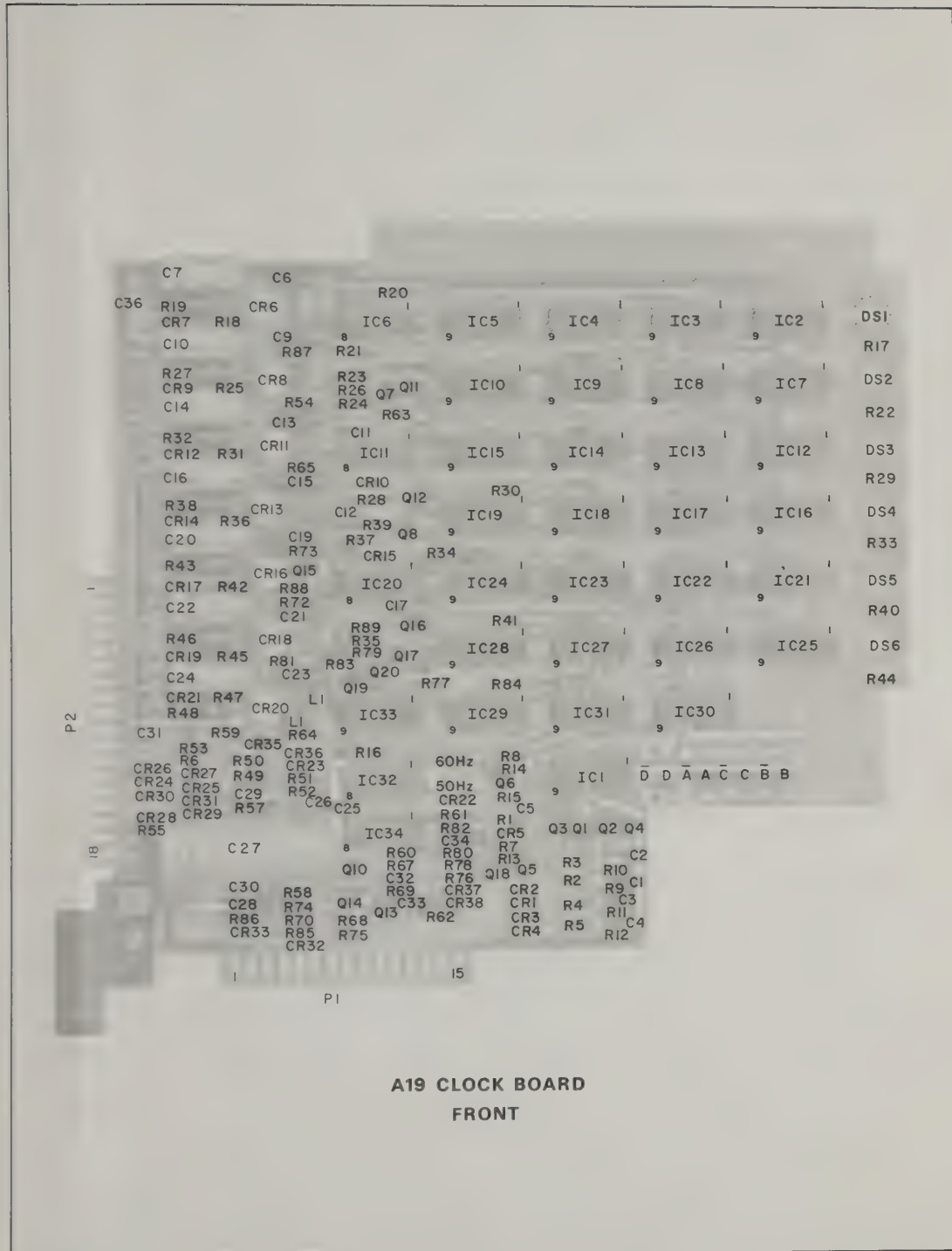


Figure 7-14. Digital Clock A19, A20 (Option 55)
(Sheet 1 of 3)



A19 CLOCK BOARD
BACK

SE

SE

SE

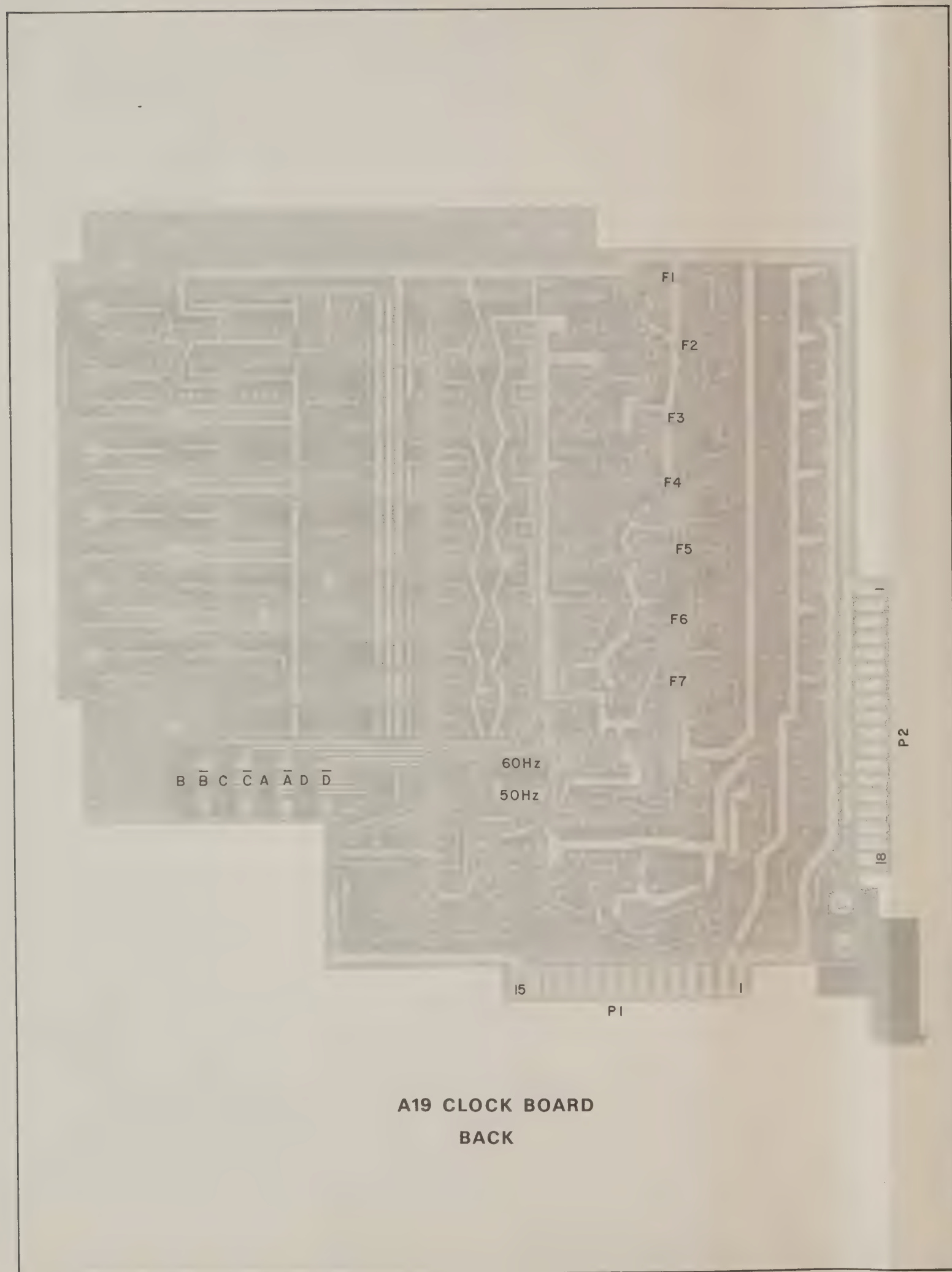
MII

MII

HR

HR

VIO



A19 CLOCK BOARD
BACK

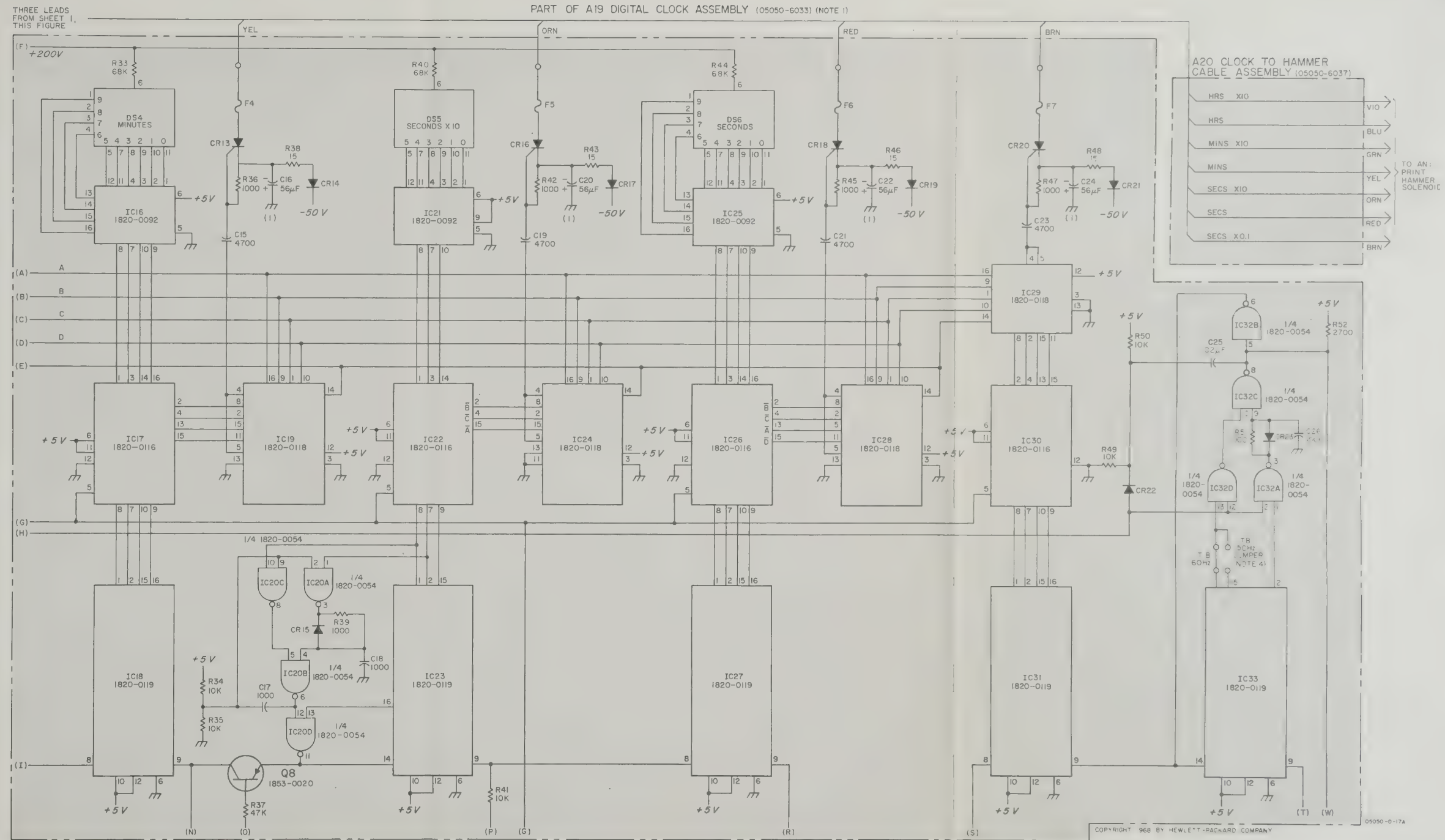
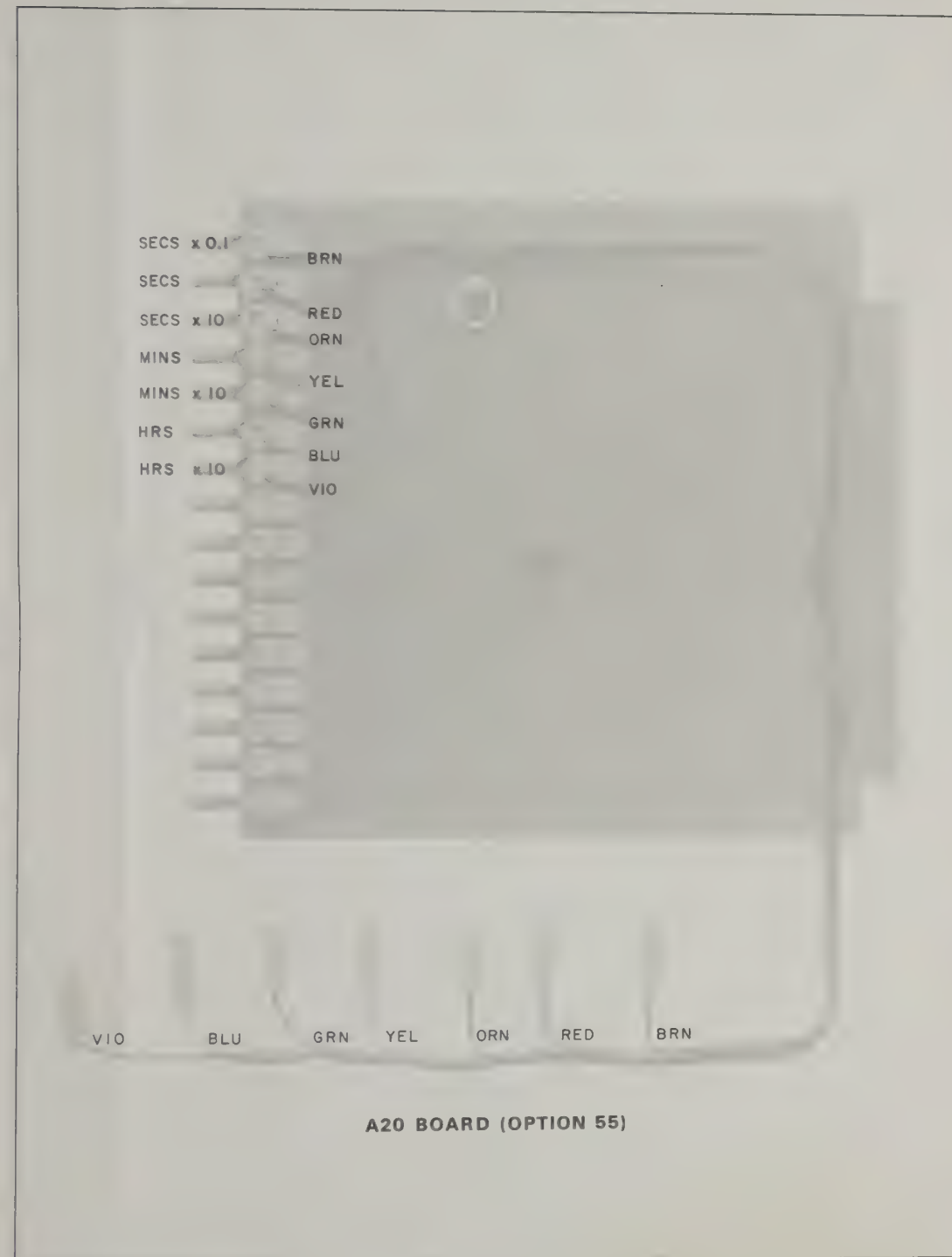


Figure 7-14. Digital Clock A19, A20 (Option 55)
(Sheet 2 of 3)

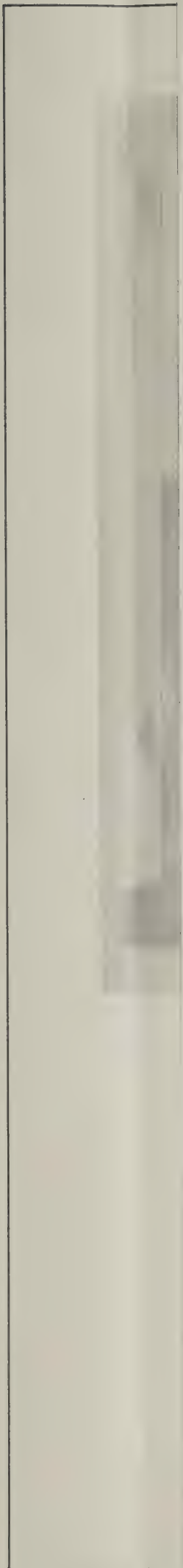


Figure 7-14
DIGITAL CLOCK A19, A20, A21 (OPTION 55)
(Sheet 3 of 3)
7-35

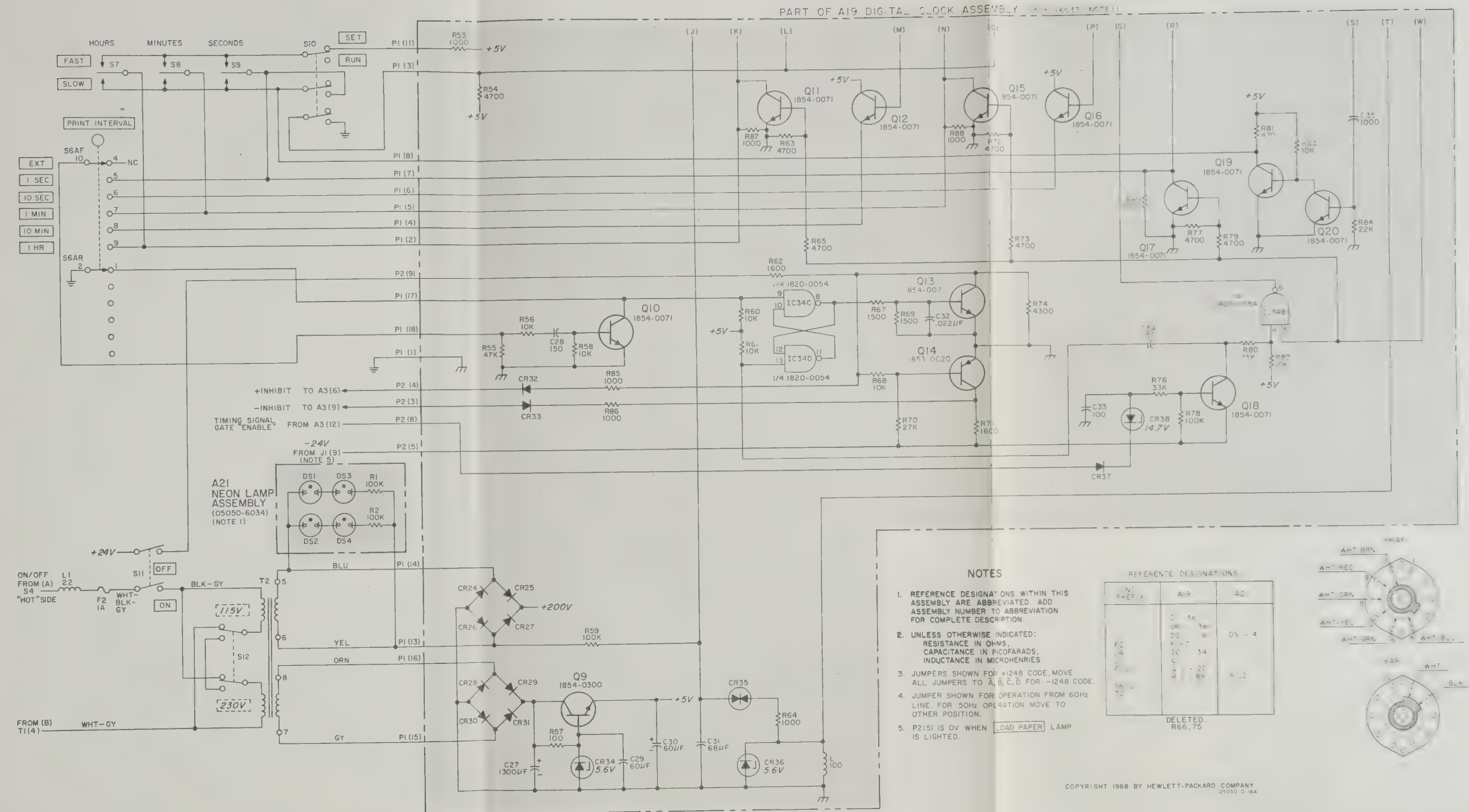


Figure 7-14. Digital Clock A19, A20 (Option 55)
(Sheet 3 of 3)

A24 OPERATION

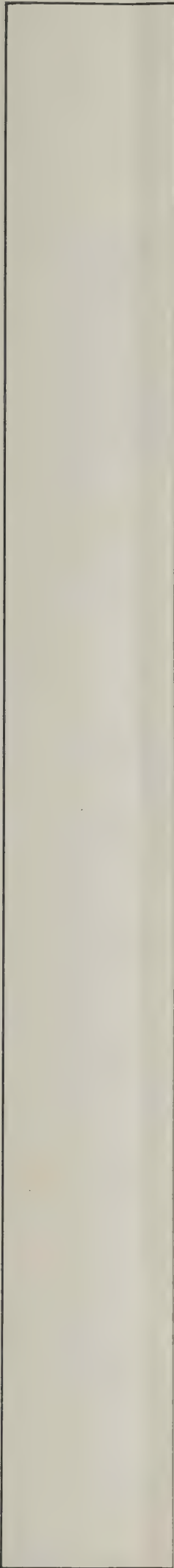
A24 Motor Control Assembly interrupts the timing gate enable between A3(12) and A4(4). The timing gate enable from A3(12) drives Q1 collector to -24 volts. This negative signal triggers the 5 sec one shot (Q2, Q3), and enables half of AND gate Q11Q12. Q2 collector goes positive enabling Q4, allowing Q6 (unijunction oscillator) to start. Triggers from Q6B1 coupled through C6 turn Q8 (triac) on, sending 115V AC to the print motor. The positive signal from Q2 collector also started the .5 sec delay (Q5, Q7, Q9), which inhibits the timing LASCOR through Q10. At the end of the .5 sec delay, the timing LASCOR will be enabled and Q12 turned on enabling the other half of AND gate Q11Q12, permitting the delayed timing gate enable to A4(4). At the end of 5 seconds, if no other inputs are viewed from A3(12), the 5 sec one shot resets turning off Q8. If another signal is received before 5 seconds the one-shot will continue in its present state for another 5 seconds.

The fault detector senses a DC level and will inhibit the .5 sec delay from timing out if the print motor fails to start.

Note: With Option 15, the PAPER ADV must be pressed twice, once to start the print motor and again to advance paper.

A24 TROUBLESHOOTING

Check for proper input signal from A3(12). If timing is wrong, check timing components for proper values. Grounding Q2 base should force Q4 on and start motor. If motor will not turn off check Q2, Q3, Q4, Q6, and Q8 circuits. If motor functions properly but will not print properly check Q5, Q7, Q9, Q10, Q11, and Q12.



02800-2

A24 OPERATION

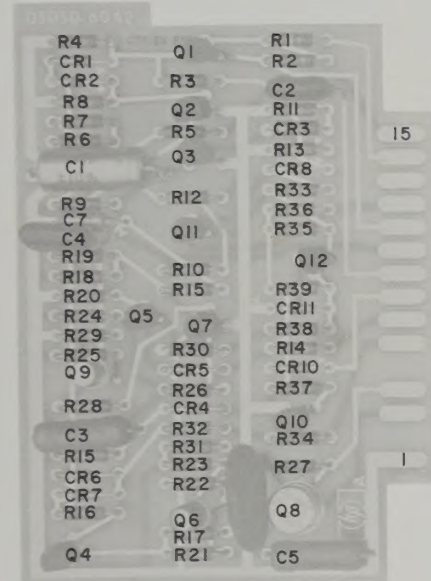
A24 Motor Control Assembly interrupts the timing gate enable between A3(12) and A4(4). The timing gate enable from A3(12) drives Q1 collector to -24 volts. This negative signal triggers the 5 sec one shot (Q2, Q3), and enables half of AND gate Q11Q12. Q2 collector goes positive enabling Q4, allowing Q6 (unijunction oscillator) to start. Triggers from Q6B1 coupled through C6 turn Q8 (triac) on, sending 115V AC to the print motor. The positive signal from Q2 collector also started the .5 sec delay (Q5, Q7, Q9), which inhibits the timing LASCN through Q10. At the end of the .5 sec delay, the timing LASCN will be enabled and Q12 turned on enabling the other half of AND gate Q11Q12, permitting the delayed timing gate enable to A4(4). At the end of 5 seconds, if no other inputs are viewed from A3(12), the 5 sec one shot resets turning off Q8. If another signal is received before 5 seconds the one-shot will continue in its present state for another 5 seconds.

The fault detector senses a DC level and will inhibit the .5 sec delay from timing out if the print motor fails to start.

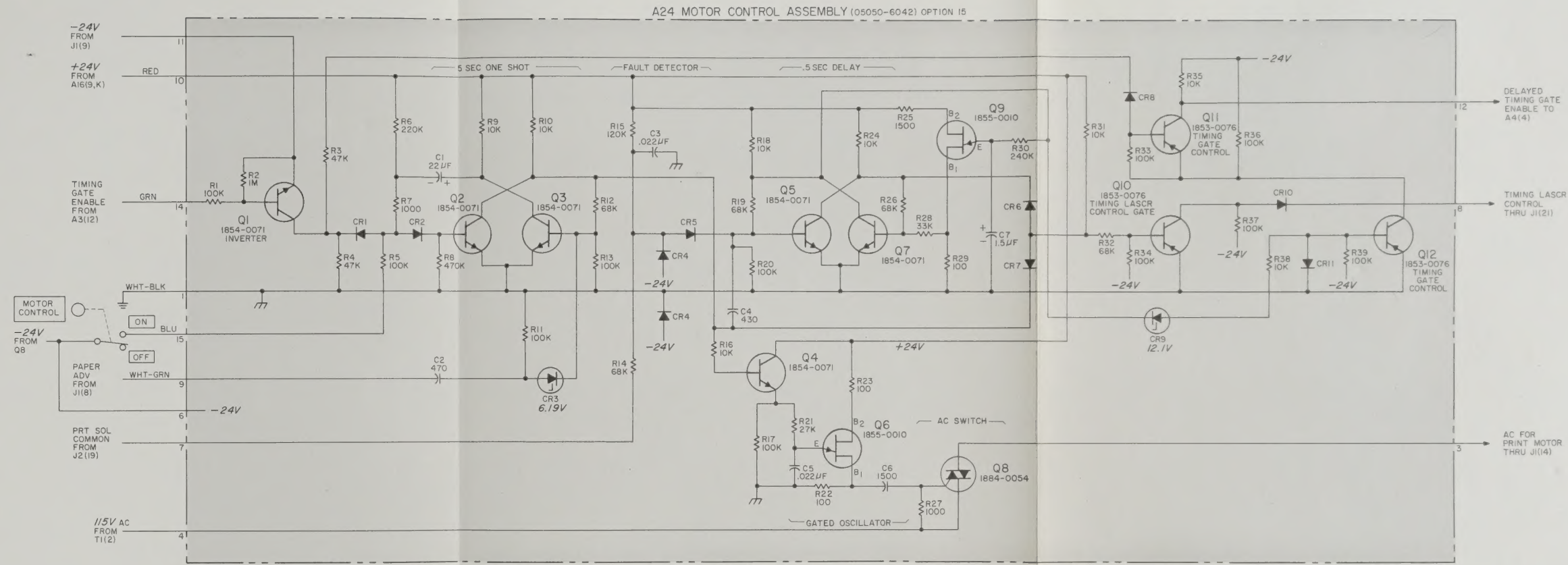
Note: With Option 15, the PAPER ADV must be pressed twice, once to start the print motor and again to advance paper.

A24 TROUBLESHOOTING

Check for proper input signal from A3(12). If timing is wrong, check timing components for proper values. Grounding Q2 base should force Q4 on and start motor. If motor will not turn off check Q2, Q3, Q4, Q6, and Q8 circuits. If motor functions properly but will not print properly check Q5, Q7, Q9, Q10, Q11, and Q12.



MOTOR CONTROL BOARD



NOTES

- REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
- UNLESS OTHERWISE INDICATED:
RESISTANCE IN OHMS;
CAPACITANCE IN PICOFARADS;

REFERENCE DESIGNATIONS

A24
C1-7
CR1-11
Q1-12
R1-39

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05050-0-19

Figure 7-15. Motor Control (Option 15)

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Printed in U.S.A. 30M-11/68

